

NOAA NESDIS
CENTRAL SATELLITE DATA PROCESSING CENTER



**Advanced Microwave Sounding Unit-A
(AMSU-A) Level 1b Format Specification
for NOAA-N and the IJPS Era**

Final Draft

June 13, 2003

AMSU-A



Computer Sciences Corporation
Laurel, Maryland

Table of Contents

1	Introduction.....	1
2	Applicable Documents	1
3	Data Representation and Storage.....	1
3.1	<i>Bit Numbering.....</i>	1
3.2	<i>Signed Integers.....</i>	2
3.3	<i>Unsigned Integers.....</i>	2
3.4	<i>Scaled Integers.....</i>	3
3.5	<i>Byte Ordering.....</i>	3
4	AMSU-A Level 1b Format Specifications.....	4
4.1	<i>AMSU-A 1b Primary Header Record Format</i>	5
4.2	<i>AMSU-A 1b Data Record Format.....</i>	21
5	Notes	32
6	Acronyms	33

1 Introduction

This document describes the AMSU-A Level 1b format for the IJPS era, which includes the NOAA-N/N' satellites and the Metop satellites. It provides Level 1b format specifications for the primary header record and the data record. Please note that as part of the updates to the Level 1b formats for NOAA-N and the IJPS era is the inclusion of additional, or secondary, header records. They will contain ancillary data set names and any metadata needed for, primarily, reprocessing. Currently, the content and format of any secondary header record is TBD. Applications that will access AMSU-A Level 1b data sets should use the "Count of Header Records in this Data Set" field, located in the first, or primary, header record, to calculate the position of the first data record and skip the secondary header records.

2 Applicable Documents

Table 1 presents a list of applicable documents (AD-#).

Doc #	Title	Reference Number	Issue	Date
AD-1	Unique Instrument Interface Specification for the AMSU-A1	IS-2617547	AC	Oct. 18, 2001
AD-2	Unique Interface Specification for the AMSU-A2	IS-2624483	Y	Oct. 18, 2001
AD-3	AMSU-A1 Instrument Interface Control Document	MO-IC-MMT-A1-0001	5	July 2001
AD-4	AMSU-A2 Instrument Interface Control Document	MO-IC-MMT-A2-0001	5	July 2001
AD-5	<u>NOAA KLM User's Guide</u>			Sept. 2000

Table 1 - Applicable Documents

3 Data Representation and Storage

This section describes the bit and byte numbering conventions used in this document, and the storage methods for integers and floating point numbers. This information is especially critical when transporting data from one computer architecture to another. Without special handling, data produced on one system may be unusable on another due to differences in internal data storage.

3.1 Bit Numbering

A byte in this document is defined as containing 8 bits. A word is 8, 16, or 32 bits in length. In all cases, the least significant bit (lsb) is designated as bit 0 and has a base-10 value of $2^0 = 1$. Therefore, in an 8-bit word the most significant bit (msb) is designated as bit 7, and has a base-10 value of $2^7 = 128$. In a 16-bit word the msb is designated as bit 15, and has a base-10 value of $2^{15} = 32,768$. In a 32-bit word the msb is designated as bit 31, and has a base-10 value of $2^{31} = 2,147,483,648$.

3.2 *Signed Integers*

For signed binary integers, the msb represents the sign of the number. The remaining bits (bits 6 through 0 for 8-bit words, 14 through 0 for 16-bit words, and 30 through 0 for 32-bit words) are used to designate the magnitude of the number. Therefore, the range of signed binary integers is based on word size as follows:

- 1 byte -128 to 127
- 2 bytes -32,768 to 32,767
- 4 bytes -2,147,483,648 to 2,147,483,647

Positive binary integers are in true binary notation with the sign bit set to zero. Negative binary integers are in two's-complement notation with the sign bit set to one. Negative binary integers are formed in two's-complement notation by inverting each bit of the positive binary integer and adding one.

3.3 *Unsigned Integers*

Unsigned binary integers use all bits including the msb to represent the magnitude of the number. Therefore, their range is as follows, again, based on word size:

- 1 byte 0 to 255
- 2 bytes 0 to 65,535
- 4 bytes 0 to 4,294,967,295

A field containing a binary integer is given the data type of unsigned integer if its content will never be negative or if a negative value just does not make sense for that field. For example, the idea of a negative scan line number or negative date or time is nonsensical. Therefore, fields containing scan line numbers, dates, and times are labeled as unsigned integers.

Unfortunately, this data type is not supported by all computer languages (e.g., FORTRAN), so additional data manipulation may be necessary. In the case of reading a 16-bit unsigned integer (DATA), a FORTRAN user could use the following code snippet to extract the actual value (VALUE):

```
...
INTEGER*2 DATA
INTEGER*4 VALUE
...
READ DATA
IF (DATA .LT. 0) THEN
    VALUE = 65536 + DATA
ELSE
    VALUE = DATA
ENDIF
...
```

But note that nearly all unsigned integer fields can be safely read into signed integer data types of the same word sizes. This is because they were originally written to the 1b using signed integer data types, and thus will be within the positive range of the corresponding signed integer

data type (see Section 3.2). The 1b format specifications will clearly indicate, by providing ranges, those unsigned integer fields that must be strictly treated as unsigned integer data types--using the data manipulation described above, if necessary--to ensure that correct values are retrieved.

However, not all fields of an unsigned integer data type contain unsigned binary integers. Fields containing *packed data* are also identified as unsigned integers. While its msb is not a sign bit, a field containing packed data does not represent an unsigned binary integer. Such a field requires the user to perform some type of special unpacking technique in order to extract the information of interest from the field in order for it to be interpreted correctly. Packed data may be bit fields, packed integers, or both. A bit field is one or more consecutive bits used to indicate one of two or more possible conditions or states. (A *bit flag* is a specialized instance of a bit field. It is a single bit indicating one of only two possible conditions.) For example, a three-bit field may indicate which of seven different modes that an instrument is operating in (i.e., 0 implies "power on mode", 1 implies "warm up mode", 2 implies "standby mode", etc.). A packed integer is simply a binary number that is stored in just a subset of an unsigned integer field's bits.

Although similar to a bit field, a packed integer is not an indicator of a condition, but an actual numeric value having magnitude that, once unpacked, could be used in arithmetic computations.

3.4 Scaled Integers

To provide maximum portability of the Level 1b data sets across different computer platforms, floating point data is represented by scaled integers. Scaled integers can be either signed or unsigned, and are simply floating point numbers multiplied by a fixed scaling factor so that a sufficiently precise representation of the original number can be stored in integer form. For example, the floating point value 1.2313 might be multiplied by 10^2 to achieve an integer value of 123. To achieve better precision, the floating point value might be multiplied by 10^3 or 10^4 to achieve an integer value of 1231 or 12313, respectively. In the Level 1b data sets, the scaling factors are powers of ten, and only the exponents (2, 3, and 4 in the previous examples) are documented within the data set. To recover an approximation of the original floating point value, divide the integer value by ten raised to the given exponent.

3.5 Byte Ordering

A major problem impeding the free transport of binary data from one computer system to another is the "Big Endian - Little Endian" dichotomy. *Big Endian* systems (e.g. IBM 370, Macintosh, SGI, Sun SPARC) store bytes of binary numeric data in reverse order relative to *Little Endian* systems (e.g. IBM PC, DEC Alpha). For example, a 32-bit hexadecimal value of x01020304 (decimal value 16,909,060) written to a binary file by a Big Endian system would be read from the file as x04030201 (decimal value 67,305,985) by a Little Endian system. Level 1b data sets generated and archived by NOAA are in Big Endian order; users with Little Endian systems must include an additional byte-swapping step when reading binary numeric data from Level 1b data sets produced by NOAA. Some processors support byte swapping in their instruction sets, but others must use compiler-dependent functions.

4 AMSU-A Level 1b Format Specifications

The format specifications for the AMSU-A Level 1b header record and AMSU-A Level 1b data record are given in this section. The meaning of each column in the format specifications is defined in Table 2.

Name	Description
Field Name	The name or brief description of the field.
Start Octet	Offset location of first octet in the defined field from beginning of record, starting with octet 1. (Note that the terms "octet" and "byte" are used interchangeably and mean the same thing.)
End Octet	Offset location of last octet in the defined field from beginning of record.
Data Type	Data Type (i - integer, u - unsigned integer, c - character). Character data is stored as ASCII.
Word Size	Number of octets per data word.
Number of Words	Number of words of indicated size and type contained in the defined field.
Scale Factor	Scaling Factor.
Units	The field's unit of measurement (e.g., octets, counts, Kelvin, volts), if applicable.
Notes	References to notes that follow the format specifications in Section 5.

Table 2 - Description of Format Specification Columns

4.1 AMSU-A 1b Primary Header Record Format

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
FILE IDENTIFICATION								
Data Set Creation Site ID CMS=Centre de Meteorologie Spatiale/France DSS=Dundee Satellite Receiving Station/UK NSS=National Environmental Satellite, Data and Information Service/USA UKM=United Kingdom Meteorological Office/UK	1	3	c	3	1	0		
<ASCII blank = x20>	4	4	c	1	1	0		
Level 1b Format Version Number	5	6	u	2	1	0		
Level 1b Format Version Year (<i>four digits, e.g., 2000</i>)	7	8	u	2	1	0		
Level 1b Format Version Day of Year (<i>e.g., 365</i>)	9	10	u	2	1	0		
<Reserved for Logical Record Length> (<i>For Creation Site use only. Logical Record Length of source 1b data set prior to processing.</i>)	11	12	u	2	1	0	octets	
<Reserved for Block Size> (<i>For Creation Site use only. Block Size of source 1b data set prior to processing.</i>)	13	14	u	2	1	0	octets	
Count of Header Records in this Data Set	15	16	u	2	1	0		
<Zero Fill>	17	22	i	2	3	0		
Data Set Name	23	64	c	42	1	0		
Processing Block Identification	65	72	c	8	1	0		
Spacecraft Identification Code 7=NOAA-N NOAA-N' Metop-1 <TBC> Metop-2 <TBC> 13=Metop-3 <TBC> 14=Metop simulator <TBC>	73	74	u	2	1	0		
Instrument ID <i>Word 1: AMSU-A2 ID Number</i> 18=flight model (FM) 3, s/n 105 (NOAA-N) 26=FM 5, s/n 107 (NOAA-N') 22=FM 4, s/n 106 (Metop-1) 34=FM 7, s/n 109 (Metop-2) 30=FM 6, s/n 108 (Metop-3)	75	76	u	1	2	0		
<i>Word 2: AMSU-A1 ID Number</i> 33=FM 7, s/n 109 (NOAA-N) 17=FM 3, s/n 105 (NOAA-N') 21=FM 4, s/n 106 (Metop-1) 25=FM 5, s/n 107 (Metop-2) 29=FM 6, s/n 108 (Metop-3)								
(NOTE: This information is current as of April 30, 2003.)								
Data Type Code 10=AMSU-A	77	78	u	2	1	0		
TIP Source Code (<i>NOAA: values defined below</i>) or <Zero Fill> (<i>Metop</i>) 0=unused, i.e., GAC/HRPT/LAC data 1=GAC-embedded AMSU and TIP 2=stored TIP (STIP) 3=HRPT/LAC-embedded AMSU and TIP 4=stored AIP (SAIP)	79	80	u	2	1	0		
Start of Data Set Day Count starting from 0 at 00h, 1 Jan 1950	81	84	u	4	1	0		
Start of Data Set Year (<i>four digits, e.g., 2000</i>)	85	86	u	2	1	0		
Start of Data Set Day of Year (<i>e.g., 365</i>)	87	88	u	2	1	0		
Start of Data Set UTC Time of Day	89	92	u	4	1	0	milliseconds	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
End of Data Set Day Count starting from 0 at 00h, 1 Jan 1950	93	96	u	4	1	0		
End of Data Set Year (<i>four digits, e.g., 2000</i>)	97	98	u	2	1	0		
End of Data Set Day of Year (<i>e.g., 365</i>)	99	100	u	2	1	0		
End of Data Set UTC Time of Day	101	104	u	4	1	0	milliseconds	
Year of Last CPIDS Update (<i>four digits, e.g., 2000</i>)	105	106	u	2	1	0		
Day of Year of Last CPIDS Update (<i>e.g., 365</i>)	107	108	u	2	1	0		
<Zero Fill>	109	120	i	2	6	0		
DATA SET QUALITY INDICATORS								
Instrument Status A2 (<i>see "Digital B Telemetry for AMSU-A2" field in data record</i>)	121	124	u	4	1	0		
bits 31-15: <zero fill>								
bit 14: cold cal position, msb								
bit 13: cold cal position, lsb								
bit 12: antenna in nadir position (0=no; 1=yes)								
bit 11: antenna in cold cal position (0=no; 1=yes)								
bit 10: antenna in warm cal position (0=no; 1=yes)								
bit 9: full scan mode (0=no; 1=yes)								
bits 5-8: <zero fill>								
bit 4: survival heater (0=off; 1=on)								
bit 3: module power (0=disconnect; 1=connect)								
bit 2: compensator motor (0=off; 1=on)								
bit 1: scanner A2 power (0=off; 1=on)								
bit 0: <zero fill>								
<Zero Fill>	125	126	i	2	1	0		
Record Number of Status Change of A2 (<i>if 0, none occurred</i>)	127	128	u	2	1	0		
Second Instrument Status A2 (<i>if previous word is 0, no change</i>)	129	132	u	4	1	0		
Instrument Status A1 (<i>see "Digital B Telemetry for AMSU-A1" field in data record</i>)	133	136	u	4	1	0		
bits 31-15: <zero fill>								
bit 14: cold cal position, msb								
bit 13: cold cal position, lsb								
bit 12: antenna in nadir position (0=no; 1=yes)								
bit 11: antenna in cold cal position (0=no; 1=yes)								
bit 10: antenna in warm cal position (0=no; 1=yes)								
bit 9: full scan mode (0=no; 1=yes)								
bits 8-6: <zero fill>								
bit 5: module power (0=disconnect; 1=connect)								
bit 4: survival heater (0=off; 1=on)								
bit 3: phase lock loop (0=redundant; 1=primary)								
bit 2: scanner A1-2 power (0=off; 1=on)								
bit 1: scanner A1-1 power (0=off; 1=on)								
bit 0: <zero fill>								
<Zero Fill>	137	138	i	2	1	0		
Record Number of Status Change of A1 (<i>if 0, none occurred</i>)	139	140	u	2	1	0		
Second Instrument Status A1 (<i>if previous word is 0, no change</i>)	141	144	u	4	1	0		
Count of Data Records in this Data Set	145	146	u	2	1	0		
Count of Calibrated, Earth Located Scan Lines in this Data Set	147	148	u	2	1	0		
Count of Missing Scan Lines	149	150	u	2	1	0		
Count of Data Gaps in this Data Set	151	152	u	2	1	0		
Count of Data Frames Without Frame Sync Word Errors (<i>NOAA</i>) or <Zero Fill> (<i>Metop</i>)	153	154	u	2	1	0		
Count of PACS Detected TIP Parity Errors (<i>NOAA</i>) or <Zero Fill> (<i>Metop</i>)	155	156	u	2	1	0		
Sum of All Auxiliary Sync Errors Detected in the Input Data (<i>NOAA</i>) or <Zero Fill> (<i>Metop</i>)	157	158	u	2	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Time Sequence Error 0=none; otherwise, the record number of the first occurrence	159	160	u	2	1	0		
Time Sequence Error Code (<i>These are bit flags taken from "Scan Line Quality Flags [Time Problem Code]" on data record reported in "Time Sequence Error" field above. If a bit is on (=1) then the statement is true.</i>) bits 15-8: <zero fill> bit 7: time field is bad but can probably be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 5: this record starts a sequence that is inconsistent with previous times (i.e., there is a time discontinuity); may be associated with a spacecraft clock update bit 4: start of a sequence that apparently repeats scan times that have been previously accepted bits 3-0: <zero fill>	161	162	u	2	1	0		
SOCC Clock Update Indicator 0=none during this orbit; otherwise, the record number of the first occurrence	163	164	u	2	1	0		
Earth Location Error Indicator 0=none during this orbit; otherwise, the record number of the first occurrence	165	166	u	2	1	0		
Earth Location Error Code (<i>These are bit flags taken from "Scan Line Quality Flags [Earth Location Problem Code]" on data record reported in "Earth Location Error Indicator" field above. If a bit is on (=1) then the statement is true.</i>) bits 15-8: <zero fill> bit 7: not earth located because of bad time; earth location fields zeroed bit 6: earth location questionable: questionable time code bit 5: earth location questionable: marginal agreement with reasonableness check bit 4: earth location questionable: fails reasonableness check bit 3: earth location questionable because of antenna position check bit 2: <zero fill> bit 1: not earth located because of satellite in-plane maneuver (Metop) or <zero fill> (NOAA) bit 0: not earth located because of satellite out-of-plane maneuver (Metop) or <zero fill> (NOAA)	167	168	u	2	1	0		
PACS Status Bit Field (<i>NOAA: value defined below</i>) or <Zero Fill> (<i>Metop</i>) bits 15-3: <zero fill> bit 2: pseudonoise (0=normal data; 1=pseudonoise data) bit 1: tape direction (0=reverse playback, time decrementing) bit 0: data mode (0=test data; 1=flight data)	169	170	u	2	1	0		
Data Source 0=unused 1=Fairbanks, AK 2=Wallops Is., VA 3=SOCC 4=Svalbard, Norway 5=Monterey, CA	171	172	u	2	1	0		
<Zero Fill>	173	176	i	4	1	0		
<Reserved for the Ingestor>	177	184	c	8	1	0		
<Reserved for Decommutation>	185	192	c	8	1	0		
<Zero Fill>	193	208	i	4	4	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
CALIBRATION								
<Zero Fill>	209	210	i	2	1	0		
Instrument Temperature Sensor ID Word 1: 0=RF Shelf A1-1; 1=RF Mux A1-1 Word 2: 0=RF Shelf A1-2; 1=RF Mux A1-2 Word 3: 0=RF Shelf A2; 1=RF Mux A2	211	216	u	2	3	0		
RF Shelf A1-1 Minimum Reference Temperature, PLLO#1	217	218	i	2	1	2K		
RF Shelf A1-1 Nominal Reference Temperature, PLLO#1	219	220	i	2	1	2K		
RF Shelf A1-1 Maximum Reference Temperature, PLLO#1	221	222	i	2	1	2K		
RF Shelf A1-2 Minimum Reference Temperature	223	224	i	2	1	2K		
RF Shelf A1-2 Nominal Reference Temperature	225	226	i	2	1	2K		
RF Shelf A1-2 Maximum Reference Temperature	227	228	i	2	1	2K		
RF Shelf A2 Minimum Reference Temperature	229	230	i	2	1	2K		
RF Shelf A2 Nominal Reference Temperature	231	232	i	2	1	2K		
RF Shelf A2 Maximum Reference Temperature	233	234	i	2	1	2K		
RF Shelf A1-1 Minimum Reference Temperature, PLLO#2	235	236	i	2	1	2K		
RF Shelf A1-1 Nominal Reference Temperature, PLLO#2	237	238	i	2	1	2K		
RF Shelf A1-1 Maximum Reference Temperature, PLLO#2	239	240	i	2	1	2K		
RF Mux A1-1 Minimum Reference Temperature, PLLO#1	241	242	i	2	1	2K		
RF Mux A1-1 Nominal Reference Temperature, PLLO#1	243	244	i	2	1	2K		
RF Mux A1-1 Maximum Reference Temperature, PLLO#1	245	246	i	2	1	2K		
RF Mux A1-2 Minimum Reference Temperature	247	248	i	2	1	2K		
RF Mux A1-2 Nominal Reference Temperature	249	250	i	2	1	2K		
RF Mux A1-2 Maximum Reference Temperature	251	252	i	2	1	2K		
RF Mux A2 Minimum Reference Temperature	253	254	i	2	1	2K		
RF Mux A2 Nominal Reference Temperature	255	256	i	2	1	2K		
RF Mux A2 Maximum Reference Temperature	257	258	i	2	1	2K		
RF Mux A1-1 Minimum Reference Temperature, PLLO#2	259	260	i	2	1	2K		
RF Mux A1-1 Nominal Reference Temperature, PLLO#2	261	262	i	2	1	2K		
RF Mux A1-1 Maximum Reference Temperature, PLLO#2	263	264	i	2	1	2K		
Warm Target Fixed Bias Corr Ch1 at Min RF Shelf Temp	265	266	i	2	1	3K		
Warm Target Fixed Bias Corr Ch1 at Nom RF Shelf Temp	267	268	i	2	1	3K		
Warm Target Fixed Bias Corr Ch1 at Max RF Shelf Temp	269	270	i	2	1	3K		
Cold Space Fixed Bias Corr Ch1	271	272	i	2	1	3K		
Warm Target Fixed Bias Corr Ch2 at Min RF Shelf Temp	273	274	i	2	1	3K		
Warm Target Fixed Bias Corr Ch2 at Nom RF Shelf Temp	275	276	i	2	1	3K		
Warm Target Fixed Bias Corr Ch2 at Max RF Shelf Temp	277	278	i	2	1	3K		
Cold Space Fixed Bias Corr Ch2	279	280	i	2	1	3K		
Warm Target Fixed Bias Corr Ch3 at Min RF Shelf Temp	281	282	i	2	1	3K		
Warm Target Fixed Bias Corr Ch3 at Nom RF Shelf Temp	283	284	i	2	1	3K		
Warm Target Fixed Bias Corr Ch3 at Max RF Shelf Temp	285	286	i	2	1	3K		
Cold Space Fixed Bias Corr Ch3	287	288	i	2	1	3K		
Warm Target Fixed Bias Corr Ch4 at Min RF Shelf Temp	289	290	i	2	1	3K		
Warm Target Fixed Bias Corr Ch4 at Nom RF Shelf Temp	291	292	i	2	1	3K		
Warm Target Fixed Bias Corr Ch4 at Max RF Shelf Temp	293	294	i	2	1	3K		
Cold Space Fixed Bias Corr Ch4	295	296	i	2	1	3K		
Warm Target Fixed Bias Corr Ch5 at Min RF Shelf Temp	297	298	i	2	1	3K		
Warm Target Fixed Bias Corr Ch5 at Nom RF Shelf Temp	299	300	i	2	1	3K		
Warm Target Fixed Bias Corr Ch5 at Max RF Shelf Temp	301	302	i	2	1	3K		
Cold Space Fixed Bias Corr Ch5	303	304	i	2	1	3K		
Warm Target Fixed Bias Corr Ch6 at Min RF Shelf Temp	305	306	i	2	1	3K		
Warm Target Fixed Bias Corr Ch6 at Nom RF Shelf Temp	307	308	i	2	1	3K		
Warm Target Fixed Bias Corr Ch6 at Max RF Shelf Temp	309	310	i	2	1	3K		
Cold Space Fixed Bias Corr Ch6	311	312	i	2	1	3K		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Warm Target Fixed Bias Corr Ch7 at Min RF Shelf Temp	313	314	i	2	1	3K		
Warm Target Fixed Bias Corr Ch7 at Nom RF Shelf Temp	315	316	i	2	1	3K		
Warm Target Fixed Bias Corr Ch7 at Max RF Shelf Temp	317	318	i	2	1	3K		
Cold Space Fixed Bias Corr Ch7	319	320	i	2	1	3K		
Warm Target Fixed Bias Corr Ch8 at Min RF Shelf Temp	321	322	i	2	1	3K		
Warm Target Fixed Bias Corr Ch8 at Nom RF Shelf Temp	323	324	i	2	1	3K		
Warm Target Fixed Bias Corr Ch8 at Max RF Shelf Temp	325	326	i	2	1	3K		
Cold Space Fixed Bias Corr Ch8	327	328	i	2	1	3K		
Warm Target Fixed Bias Corr Ch9 at Min RF Shelf Temp	329	330	i	2	1	3K		
Warm Target Fixed Bias Corr Ch9 at Nom RF Shelf Temp	331	332	i	2	1	3K		
Warm Target Fixed Bias Corr Ch9 at Max RF Shelf Temp	333	334	i	2	1	3K		
Cold Space Fixed Bias Corr Ch9	335	336	i	2	1	3K		
Warm Target Fixed Bias Corr Ch10 at Min RF Shelf Temp	337	338	i	2	1	3K		
Warm Target Fixed Bias Corr Ch10 at Nom RF Shelf Temp	339	340	i	2	1	3K		
Warm Target Fixed Bias Corr Ch10 at Max RF Shelf Temp	341	342	i	2	1	3K		
Cold Space Fixed Bias Corr Ch10	343	344	i	2	1	3K		
Warm Target Fixed Bias Corr Ch11 at Min RF Shelf Temp	345	346	i	2	1	3K		
Warm Target Fixed Bias Corr Ch11 at Nom RF Shelf Temp	347	348	i	2	1	3K		
Warm Target Fixed Bias Corr Ch11 at Max RF Shelf Temp	349	350	i	2	1	3K		
Cold Space Fixed Bias Corr Ch11	351	352	i	2	1	3K		
Warm Target Fixed Bias Corr Ch12 at Min RF Shelf Temp	353	354	i	2	1	3K		
Warm Target Fixed Bias Corr Ch12 at Nom RF Shelf Temp	355	356	i	2	1	3K		
Warm Target Fixed Bias Corr Ch12 at Max RF Shelf Temp	357	358	i	2	1	3K		
Cold Space Fixed Bias Corr Ch12	359	360	i	2	1	3K		
Warm Target Fixed Bias Corr Ch13 at Min RF Shelf Temp	361	362	i	2	1	3K		
Warm Target Fixed Bias Corr Ch13 at Nom RF Shelf Temp	363	364	i	2	1	3K		
Warm Target Fixed Bias Corr Ch13 at Max RF Shelf Temp	365	366	i	2	1	3K		
Cold Space Fixed Bias Corr Ch13	367	368	i	2	1	3K		
Warm Target Fixed Bias Corr Ch14 at Min RF Shelf Temp	369	370	i	2	1	3K		
Warm Target Fixed Bias Corr Ch14 at Nom RF Shelf Temp	371	372	i	2	1	3K		
Warm Target Fixed Bias Corr Ch14 at Max RF Shelf Temp	373	374	i	2	1	3K		
Cold Space Fixed Bias Corr Ch14	375	376	i	2	1	3K		
Warm Target Fixed Bias Corr Ch15 at Min RF Shelf Temp	377	378	i	2	1	3K		
Warm Target Fixed Bias Corr Ch15 at Nom RF Shelf Temp	379	380	i	2	1	3K		
Warm Target Fixed Bias Corr Ch15 at Max RF Shelf Temp	381	382	i	2	1	3K		
Cold Space Fixed Bias Corr Ch15	383	384	i	2	1	3K		
Warm Target Bias Corr Ch9 at PLLO#2 RF Shelf A1-1 Min Ref Temp	385	386	i	2	1	3K		
Warm Target Bias Corr Ch9 at PLLO#2 RF Shelf A1-1 Nom Ref Temp	387	388	i	2	1	3K		
Warm Target Bias Corr Ch9 at PLLO#2 RF Shelf A1-1 Max Ref Temp	389	390	i	2	1	3K		
Warm Target Bias Corr Ch10 at PLLO#2 RF Shelf A1-1 Min Ref Temp	391	392	i	2	1	3K		
Warm Target Bias Corr Ch10 at PLLO#2 RF Shelf A1-1 Nom Ref Temp	393	394	i	2	1	3K		
Warm Target Bias Corr Ch10 at PLLO#2 RF Shelf A1-1 Max Ref Temp	395	396	i	2	1	3K		
Warm Target Bias Corr Ch11 at PLLO#2 RF Shelf A1-1 Min Ref Temp	397	398	i	2	1	3K		
Warm Target Bias Corr Ch11 at PLLO#2 RF Shelf A1-1 Nom Ref Temp	399	400	i	2	1	3K		
Warm Target Bias Corr Ch11 at PLLO#2 RF Shelf A1-1 Max Ref Temp	401	402	i	2	1	3K		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Warm Target Bias Corr Ch12 at PLLO#2 RF Shelf A1-1 Min Ref Temp	403	404	i	2	1	3K		
Warm Target Bias Corr Ch12 at PLLO#2 RF Shelf A1-1 Nom Ref Temp	405	406	i	2	1	3K		
Warm Target Bias Corr Ch12 at PLLO#2 RF Shelf A1-1 Max Ref Temp	407	408	i	2	1	3K		
Warm Target Bias Corr Ch13 at PLLO#2 RF Shelf A1-1 Min Ref Temp	409	410	i	2	1	3K		
Warm Target Bias Corr Ch13 at PLLO#2 RF Shelf A1-1 Nom Ref Temp	411	412	i	2	1	3K		
Warm Target Bias Corr Ch13 at PLLO#2 RF Shelf A1-1 Max Ref Temp	413	414	i	2	1	3K		
Warm Target Bias Corr Ch14 at PLLO#2 RF Shelf A1-1 Min Ref Temp	415	416	i	2	1	3K		
Warm Target Bias Corr Ch14 at PLLO#2 RF Shelf A1-1 Nom Ref Temp	417	418	i	2	1	3K		
Warm Target Bias Corr Ch14 at PLLO#2 RF Shelf A1-1 Max Ref Temp	419	420	i	2	1	3K		
Nonlinearity Coef. Ch 1 at Min Ref Temp	421	424	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 1 at Nom Ref Temp	425	428	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 1 at Max Ref Temp	429	432	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 2 at Min Ref Temp	433	436	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 2 at Nom Ref Temp	437	440	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 2 at Max Ref Temp	441	444	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 3 at Min Ref Temp	445	448	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 3 at Nom Ref Temp	449	452	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 3 at Max Ref Temp	453	456	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 4 at Min Ref Temp	457	460	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 4 at Nom Ref Temp	461	464	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 4 at Max Ref Temp	465	468	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 5 at Min Ref Temp	469	472	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 5 at Nom Ref Temp	473	476	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 5 at Max Ref Temp	477	480	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 6 at Min Ref Temp	481	484	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 6 at Nom Ref Temp	485	488	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 6 at Max Ref Temp	489	492	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 7 at Min Ref Temp	493	496	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 7 at Nom Ref Temp	497	500	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 7 at Max Ref Temp	501	504	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 8 at Min Ref Temp	505	508	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 8 at Nom Ref Temp	509	512	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 8 at Max Ref Temp	513	516	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 9 at Min Ref Temp	517	520	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 9 at Nom Ref Temp	521	524	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 9 at Max Ref Temp	525	528	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 10 at Min Ref Temp	529	532	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 10 at Nom Ref Temp	533	536	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 10 at Max Ref Temp	537	540	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 11 at Min Ref Temp	541	544	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 11 at Nom Ref Temp	545	548	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 11 at Max Ref Temp	549	552	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 12 at Min Ref Temp	553	556	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 12 at Nom Ref Temp	557	560	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 12 at Max Ref Temp	561	564	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Nonlinearity Coef. Ch 13 at Min Ref Temp	565	568	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 13 at Nom Ref Temp	569	572	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 13 at Max Ref Temp	573	576	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 14 at Min Ref Temp	577	580	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 14 at Nom Ref Temp	581	584	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 14 at Max Ref Temp	585	588	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 15 at Min Ref Temp	589	592	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 15 at Nom Ref Temp	593	596	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 15 at Max Ref Temp	597	600	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 9 for PLLO#2 at Min Ref Temp	601	604	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 9 for PLLO#2 at Nom Ref Temp	605	608	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 9 for PLLO#2 at Max Ref Temp	609	612	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 10 for PLLO#2 at Min Ref Temp	613	616	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 10 for PLLO#2 at Nom Ref Temp	617	620	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 10 for PLLO#2 at Max Ref Temp	621	624	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 11 for PLLO#2 at Min Ref Temp	625	628	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 11 for PLLO#2 at Nom Ref Temp	629	632	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 11 for PLLO#2 at Max Ref Temp	633	636	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 12 for PLLO#2 at Min Ref Temp	637	640	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 12 for PLLO#2 at Nom Ref Temp	641	644	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 12 for PLLO#2 at Max Ref Temp	645	648	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 13 for PLLO#2 at Min Ref Temp	649	652	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 13 for PLLO#2 at Nom Ref Temp	653	656	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 13 for PLLO#2 at Max Ref Temp	657	660	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 14 for PLLO#2 at Min Ref Temp	661	664	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 14 for PLLO#2 at Nom Ref Temp	665	668	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
Nonlinearity Coef. Ch 14 for PLLO#2 at Max Ref Temp	669	672	i	4	1	$6\text{m}^2\text{-sr-cm}^{-1}/\text{mW}$		
<Zero Fill>	673	688	i	4	4	0		
TEMPERATURE-RADIANCE CONVERSION								
Temperature-radiance Ch 1 Central Wavenumber	689	692	i	4	1	6cm^{-1}		
Temperature-radiance Ch 1 Constant 1	693	696	i	4	1	6		
Temperature-radiance Ch 1 Constant 2, Slope	697	700	i	4	1	6		
Temperature-radiance Ch 2 Central Wavenumber	701	704	i	4	1	6cm^{-1}		
Temperature-radiance Ch 2 Constant 1	705	708	i	4	1	6		
Temperature-radiance Ch 2 Constant 2, Slope	709	712	i	4	1	6		
Temperature-radiance Ch 3 Central Wavenumber	713	716	i	4	1	6cm^{-1}		
Temperature-radiance Ch 3 Constant 1	717	720	i	4	1	6		
Temperature-radiance Ch 3 Constant 2, Slope	721	724	i	4	1	6		
Temperature-radiance Ch 4 Central Wavenumber	725	728	i	4	1	6cm^{-1}		
Temperature-radiance Ch 4 Constant 1	729	732	i	4	1	6		
Temperature-radiance Ch 4 Constant 2, Slope	733	736	i	4	1	6		
Temperature-radiance Ch 5 Central Wavenumber	737	740	i	4	1	6cm^{-1}		
Temperature-radiance Ch 5 Constant 1	741	744	i	4	1	6		
Temperature-radiance Ch 5 Constant 2, Slope	745	748	i	4	1	6		
Temperature-radiance Ch 6 Central Wavenumber	749	752	i	4	1	6cm^{-1}		
Temperature-radiance Ch 6 Constant 1	753	756	i	4	1	6		
Temperature-radiance Ch 6 Constant 2, Slope	757	760	i	4	1	6		
Temperature-radiance Ch 7 Central Wavenumber	761	764	i	4	1	6cm^{-1}		
Temperature-radiance Ch 7 Constant 1	765	768	i	4	1	6		
Temperature-radiance Ch 7 Constant 2, Slope	769	772	i	4	1	6		
Temperature-radiance Ch 8 Central Wavenumber	773	776	i	4	1	6cm^{-1}		
Temperature-radiance Ch 8 Constant 1	777	780	i	4	1	6		
Temperature-radiance Ch 8 Constant 2, Slope	781	784	i	4	1	6		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Temperature-radiance Ch 9 Central Wavenumber	785	788	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 9 Constant 1	789	792	i	4	1	6		
Temperature-radiance Ch 9 Constant 2, Slope	793	796	i	4	1	6		
Temperature-radiance Ch 10 Central Wavenumber	797	800	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 10 Constant 1	801	804	i	4	1	6		
Temperature-radiance Ch 10 Constant 2, Slope	805	808	i	4	1	6		
Temperature-radiance Ch 11 Central Wavenumber	809	812	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 11 Constant 1	813	816	i	4	1	6		
Temperature-radiance Ch 11 Constant 2, Slope	817	820	i	4	1	6		
Temperature-radiance Ch 12 Central Wavenumber	821	824	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 12 Constant 1	825	828	i	4	1	6		
Temperature-radiance Ch 12 Constant 2, Slope	829	832	i	4	1	6		
Temperature-radiance Ch 13 Central Wavenumber	833	836	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 13 Constant 1	837	840	i	4	1	6		
Temperature-radiance Ch 13 Constant 2, Slope	841	844	i	4	1	6		
Temperature-radiance Ch 14 Central Wavenumber	845	848	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 14 Constant 1	849	852	i	4	1	6		
Temperature-radiance Ch 14 Constant 2, Slope	853	856	i	4	1	6		
Temperature-radiance Ch 15 Central Wavenumber	857	860	i	4	1	6	cm ⁻¹	
Temperature-radiance Ch 15 Constant 1	861	864	i	4	1	6		
Temperature-radiance Ch 15 Constant 2, Slope	865	868	i	4	1	6		
<Zero Fill>	869	880	i	4	3	0		
NAVIGATION								
Reference Ellipsoid Model ID (<i>The ellipsoid is a mathematically tractable approximation of the geoid, which is an equipotential surface at mean sea level. The maximum departure of the ellipsoid from the geoid is approximately +/- 65 meters.</i>)	881	888	c	8	1	0		
WGS-72=World Geodetic Survey 1972								
Nadir Earth Location Tolerance	889	890	u	2	1	1	kilometers	
Earth Location Bit Field bits 15-2: <zero fill> bit 1: reasonableness test (0=inactive; 1=active) bit 0: attitude error correction (0=not corrected; 1=corrected)	891	892	u	2	1	0		
<Zero Fill>	893	894	i	2	1	0		
Constant Roll Attitude Error	895	896	i	2	1	3	degrees	
Constant Pitch Attitude Error	897	898	i	2	1	3	degrees	
Constant Yaw Attitude Error	899	900	i	2	1	3	degrees	
Epoch Year for Orbit Vector	901	902	u	2	1	0		
Day of Epoch Year for Orbit Vector	903	904	u	2	1	0		
Epoch UTC Time of Day for Orbit Vector	905	908	u	4	1	0	milliseconds	
Semi-major Axis (<i>at the orbit vector epoch time</i>)	909	912	i	4	1	5	kilometers	
Eccentricity (<i>at the orbit vector epoch time</i>)	913	916	i	4	1	8		
Inclination (<i>at the orbit vector epoch time</i>)	917	920	i	4	1	5	degrees	
Argument of Perigee (<i>at the orbit vector epoch time</i>)	921	924	i	4	1	5	degrees	
Right Ascension of the Ascending Node (<i>at the orbit vector epoch time</i>)	925	928	i	4	1	5	degrees	
Mean Anomaly (<i>at the orbit vector epoch time</i>)	929	932	i	4	1	5	degrees	
Position Vector X Component (<i>at the orbit vector epoch time</i>)	933	936	i	4	1	5	kilometers	
Position Vector Y Component (<i>at the orbit vector epoch time</i>)	937	940	i	4	1	5	kilometers	
Position Vector Z Component (<i>at the orbit vector epoch time</i>)	941	944	i	4	1	5	kilometers	
Velocity Vector X-dot Component (<i>at the orbit vector epoch time</i>)	945	948	i	4	1	8	km/second	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Velocity Vector Y-dot Component (<i>at the orbit vector epoch time</i>)	949	952	i	4	1	8	km/second	
Velocity Vector Z-dot Component (<i>at the orbit vector epoch time</i>)	953	956	i	4	1	8	km/second	
Earth/Sun Distance Ratio (<i>at the orbit vector epoch time; relative to the mean distance of 1 AU</i>)	957	960	u	4	1	6		
<Zero Fill>	961	976	i	4	4	0		
AMSU-A1 DIGITAL A CONVERSION								
<i>Counts-to-temperature conversion coefficients for the AMSU-A1 digital A telemetry items.</i>								
Scan Motor A1-1 Temperature Coefficient 0	977	980	i	4	1	4	K	
Scan Motor A1-1 Temperature Coefficient 1	981	984	i	4	1	9	K/count	
Scan Motor A1-1 Temperature Coefficient 2	985	988	i	4	1	16	K/count ²	
Scan Motor A1-1 Temperature Coefficient 3	989	992	i	4	1	20	K/count ³	
Scan Motor A1-2 Temperature Coefficient 0	993	996	i	4	1	4	K	
Scan Motor A1-2 Temperature Coefficient 1	997	1000	i	4	1	9	K/count	
Scan Motor A1-2 Temperature Coefficient 2	1001	1004	i	4	1	16	K/count ²	
Scan Motor A1-2 Temperature Coefficient 3	1005	1008	i	4	1	20	K/count ³	
Feed Horn A1-1 Temperature Coefficient 0	1009	1012	i	4	1	4	K	
Feed Horn A1-1 Temperature Coefficient 1	1013	1016	i	4	1	9	K/count	
Feed Horn A1-1 Temperature Coefficient 2	1017	1020	i	4	1	16	K/count ²	
Feed Horn A1-1 Temperature Coefficient 3	1021	1024	i	4	1	20	K/count ³	
Feed Horn A1-2 Temperature Coefficient 0	1025	1028	i	4	1	4	K	
Feed Horn A1-2 Temperature Coefficient 1	1029	1032	i	4	1	9	K/count	
Feed Horn A1-2 Temperature Coefficient 2	1033	1036	i	4	1	16	K/count ²	
Feed Horn A1-2 Temperature Coefficient 3	1037	1040	i	4	1	20	K/count ³	
Mux A1-1 Temperature Coefficient 0	1041	1044	i	4	1	4	K	
RF Mux A1-1 Temperature Coefficient 1	1045	1048	i	4	1	9	K/count	
RF Mux A1-1 Temperature Coefficient 2	1049	1052	i	4	1	16	K/count ²	
RF Mux A1-1 Temperature Coefficient 3	1053	1056	i	4	1	20	K/count ³	
RF Mux A1-2 Temperature Coefficient 0	1057	1060	i	4	1	4	K	
RF Mux A1-2 Temperature Coefficient 1	1061	1064	i	4	1	9	K/count	
RF Mux A1-2 Temperature Coefficient 2	1065	1068	i	4	1	16	K/count ²	
RF Mux A1-2 Temperature Coefficient 3	1069	1072	i	4	1	20	K/count ³	
Local Oscillator Channel 3 Temperature Coefficient 0	1073	1076	i	4	1	4	K	
Local Oscillator Channel 3 Temperature Coefficient 1	1077	1080	i	4	1	9	K/count	
Local Oscillator Channel 3 Temperature Coefficient 2	1081	1084	i	4	1	16	K/count ²	
Local Oscillator Channel 3 Temperature Coefficient 3	1085	1088	i	4	1	20	K/count ³	
Local Oscillator Channel 4 Temperature Coefficient 0	1089	1092	i	4	1	4	K	
Local Oscillator Channel 4 Temperature Coefficient 1	1093	1096	i	4	1	9	K/count	
Local Oscillator Channel 4 Temperature Coefficient 2	1097	1100	i	4	1	16	K/count ²	
Local Oscillator Channel 4 Temperature Coefficient 3	1101	1104	i	4	1	20	K/count ³	
Local Oscillator Channel 5 Temperature Coefficient 0	1105	1108	i	4	1	4	K	
Local Oscillator Channel 5 Temperature Coefficient 1	1109	1112	i	4	1	9	K/count	
Local Oscillator Channel 5 Temperature Coefficient 2	1113	1116	i	4	1	16	K/count ²	
Local Oscillator Channel 5 Temperature Coefficient 3	1117	1120	i	4	1	20	K/count ³	
Local Oscillator Channel 6 Temperature Coefficient 0	1121	1124	i	4	1	4	K	
Local Oscillator Channel 6 Temperature Coefficient 1	1125	1128	i	4	1	9	K/count	
Local Oscillator Channel 6 Temperature Coefficient 2	1129	1132	i	4	1	16	K/count ²	
Local Oscillator Channel 6 Temperature Coefficient 3	1133	1136	i	4	1	20	K/count ³	
Local Oscillator Channel 7 Temperature Coefficient 0	1137	1140	i	4	1	4	K	
Local Oscillator Channel 7 Temperature Coefficient 1	1141	1144	i	4	1	9	K/count	
Local Oscillator Channel 7 Temperature Coefficient 2	1145	1148	i	4	1	16	K/count ²	
Local Oscillator Channel 7 Temperature Coefficient 3	1149	1152	i	4	1	20	K/count ³	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Local Oscillator Channel 8 Temperature Coefficient 0	1153	1156	i	4	1	4K		
Local Oscillator Channel 8 Temperature Coefficient 1	1157	1160	i	4	1	9K/count		
Local Oscillator Channel 8 Temperature Coefficient 2	1161	1164	i	4	1	16K/count ²		
Local Oscillator Channel 8 Temperature Coefficient 3	1165	1168	i	4	1	20K/count ³		
Local Oscillator Channel 15 Temperature Coefficient 0	1169	1172	i	4	1	4K		
Local Oscillator Channel 15 Temperature Coefficient 1	1173	1176	i	4	1	9K/count		
Local Oscillator Channel 15 Temperature Coefficient 2	1177	1180	i	4	1	16K/count ²		
Local Oscillator Channel 15 Temperature Coefficient 3	1181	1184	i	4	1	20K/count ³		
PLLO #2 Channels 9 Through 14 Temperature Coefficient 0	1185	1188	i	4	1	4K		
PLLO #2 Channels 9 Through 14 Temperature Coefficient 1	1189	1192	i	4	1	9K/count		
PLLO #2 Channels 9 Through 14 Temperature Coefficient 2	1193	1196	i	4	1	16K/count ²		
PLLO #2 Channels 9 Through 14 Temperature Coefficient 3	1197	1200	i	4	1	20K/count ³		
PLLO #1 Channels 9 Through 14 Temperature Coefficient 0	1201	1204	i	4	1	4K		
PLLO #1 Channels 9 Through 14 Temperature Coefficient 1	1205	1208	i	4	1	9K/count		
PLLO #1 Channels 9 Through 14 Temperature Coefficient 2	1209	1212	i	4	1	16K/count ²		
PLLO #1 Channels 9 Through 14 Temperature Coefficient 3	1213	1216	i	4	1	20K/count ³		
PLLO (Reference Oscillator) Temperature Coefficient 0	1217	1220	i	4	1	4K	1	
PLLO (Reference Oscillator) Temperature Coefficient 1	1221	1224	i	4	1	9K/count	1	
PLLO (Reference Oscillator) Temperature Coefficient 2	1225	1228	i	4	1	16K/count ²	1	
PLLO (Reference Oscillator) Temperature Coefficient 3	1229	1232	i	4	1	20K/count ³	1	
Mixer/IF Amplifier Channel 3 Temperature Coefficient 0	1233	1236	i	4	1	4K		
Mixer/IF Amplifier Channel 3 Temperature Coefficient 1	1237	1240	i	4	1	9K/count		
Mixer/IF Amplifier Channel 3 Temperature Coefficient 2	1241	1244	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 3 Temperature Coefficient 3	1245	1248	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 4 Temperature Coefficient 0	1249	1252	i	4	1	4K		
Mixer/IF Amplifier Channel 4 Temperature Coefficient 1	1253	1256	i	4	1	9K/count		
Mixer/IF Amplifier Channel 4 Temperature Coefficient 2	1257	1260	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 4 Temperature Coefficient 3	1261	1264	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 5 Temperature Coefficient 0	1265	1268	i	4	1	4K		
Mixer/IF Amplifier Channel 5 Temperature Coefficient 1	1269	1272	i	4	1	9K/count		
Mixer/IF Amplifier Channel 5 Temperature Coefficient 2	1273	1276	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 5 Temperature Coefficient 3	1277	1280	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 6 Temperature Coefficient 0	1281	1284	i	4	1	4K		
Mixer/IF Amplifier Channel 6 Temperature Coefficient 1	1285	1288	i	4	1	9K/count		
Mixer/IF Amplifier Channel 6 Temperature Coefficient 2	1289	1292	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 6 Temperature Coefficient 3	1293	1296	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 7 Temperature Coefficient 0	1297	1300	i	4	1	4K		
Mixer/IF Amplifier Channel 7 Temperature Coefficient 1	1301	1304	i	4	1	9K/count		
Mixer/IF Amplifier Channel 7 Temperature Coefficient 2	1305	1308	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 7 Temperature Coefficient 3	1309	1312	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 8 Temperature Coefficient 0	1313	1316	i	4	1	4K		
Mixer/IF Amplifier Channel 8 Temperature Coefficient 1	1317	1320	i	4	1	9K/count		
Mixer/IF Amplifier Channel 8 Temperature Coefficient 2	1321	1324	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 8 Temperature Coefficient 3	1325	1328	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 9/14 Temperature Coefficient 0	1329	1332	i	4	1	4K		
Mixer/IF Amplifier Channel 9/14 Temperature Coefficient 1	1333	1336	i	4	1	9K/count		
Mixer/IF Amplifier Channel 9/14 Temperature Coefficient 2	1337	1340	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 9/14 Temperature Coefficient 3	1341	1344	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 15 Temperature Coefficient 0	1345	1348	i	4	1	4K		
Mixer/IF Amplifier Channel 15 Temperature Coefficient 1	1349	1352	i	4	1	9K/count		
Mixer/IF Amplifier Channel 15 Temperature Coefficient 2	1353	1356	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 15 Temperature Coefficient 3	1357	1360	i	4	1	20K/count ³		
IF Amplifier Channel 11/14 Temperature Coefficient 0	1361	1364	i	4	1	4K		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Amplifier Channel 11/14 Temperature Coefficient 1	1365	1368	i	4	1	9K/count		
Amplifier Channel 11/14 Temperature Coefficient 2	1369	1372	i	4	1	16K/count ²		
IF Amplifier Channel 11/14 Temperature Coefficient 3	1373	1376	i	4	1	20K/count ³		
IF Amplifier Channel 9 Temperature Coefficient 0	1377	1380	i	4	1	4K		
IF Amplifier Channel 9 Temperature Coefficient 1	1381	1384	i	4	1	9K/count		
IF Amplifier Channel 9 Temperature Coefficient 2	1385	1388	i	4	1	16K/count ²		
IF Amplifier Channel 9 Temperature Coefficient 3	1389	1392	i	4	1	20K/count ³		
IF Amplifier Channel 10 Temperature Coefficient 0	1393	1396	i	4	1	4K		
IF Amplifier Channel 10 Temperature Coefficient 1	1397	1400	i	4	1	9K/count		
IF Amplifier Channel 10 Temperature Coefficient 2	1401	1404	i	4	1	16K/count ²		
IF Amplifier Channel 10 Temperature Coefficient 3	1405	1408	i	4	1	20K/count ³		
IF Amplifier Channel 11 Temperature Coefficient 0	1409	1412	i	4	1	4K		
IF Amplifier Channel 11 Temperature Coefficient 1	1413	1416	i	4	1	9K/count		
IF Amplifier Channel 11 Temperature Coefficient 2	1417	1420	i	4	1	16K/count ²		
IF Amplifier Channel 11 Temperature Coefficient 3	1421	1424	i	4	1	20K/count ³		
DC/DC Converter Temperature Coefficient 0	1425	1428	i	4	1	4K		
DC/DC Converter Temperature Coefficient 1	1429	1432	i	4	1	9K/count		
DC/DC Converter Temperature Coefficient 2	1433	1436	i	4	1	16K/count ²		
DC/DC Converter Temperature Coefficient 3	1437	1440	i	4	1	20K/count ³		
IF Amplifier Channel 13 Temperature Coefficient 0	1441	1444	i	4	1	4K		
IF Amplifier Channel 13 Temperature Coefficient 1	1445	1448	i	4	1	9K/count		
IF Amplifier Channel 13 Temperature Coefficient 2	1449	1452	i	4	1	16K/count ²		
IF Amplifier Channel 13 Temperature Coefficient 3	1453	1456	i	4	1	20K/count ³		
IF Amplifier Channel 14 Temperature Coefficient 0	1457	1460	i	4	1	4K		
IF Amplifier Channel 14 Temperature Coefficient 1	1461	1464	i	4	1	9K/count		
IF Amplifier Channel 14 Temperature Coefficient 2	1465	1468	i	4	1	16K/count ²		
IF Amplifier Channel 14 Temperature Coefficient 3	1469	1472	i	4	1	20K/count ³		
IF Amplifier Channel 12 Temperature Coefficient 0	1473	1476	i	4	1	4K		
IF Amplifier Channel 12 Temperature Coefficient 1	1477	1480	i	4	1	9K/count		
IF Amplifier Channel 12 Temperature Coefficient 2	1481	1484	i	4	1	16K/count ²		
IF Amplifier Channel 12 Temperature Coefficient 3	1485	1488	i	4	1	20K/count ³		
RF Shelf A1-1 Temperature Coefficient 0	1489	1492	i	4	1	4K		
RF Shelf A1-1 Temperature Coefficient 1	1493	1496	i	4	1	9K/count		
RF Shelf A1-1 Temperature Coefficient 2	1497	1500	i	4	1	16K/count ²		
RF Shelf A1-1 Temperature Coefficient 3	1501	1504	i	4	1	20K/count ³		
RF Shelf A1-2 Temperature Coefficient 0	1505	1508	i	4	1	4K		
RF Shelf A1-2 Temperature Coefficient 1	1509	1512	i	4	1	9K/count		
RF Shelf A1-2 Temperature Coefficient 2	1513	1516	i	4	1	16K/count ²		
RF Shelf A1-2 Temperature Coefficient 3	1517	1520	i	4	1	20K/count ³		
Detector/preamp Assembly Temperature Coefficient 0	1521	1524	i	4	1	4K		
Detector/preamp Assembly Temperature Coefficient 1	1525	1528	i	4	1	9K/count		
Detector/preamp Assembly Temperature Coefficient 2	1529	1532	i	4	1	16K/count ²		
Detector/preamp Assembly Temperature Coefficient 3	1533	1536	i	4	1	20K/count ³		
A1-1 Warm Load 1 Temperature Coefficient 0	1537	1540	i	4	1	4K		
A1-1 Warm Load 1 Temperature Coefficient 1	1541	1544	i	4	1	9K/count		
A1-1 Warm Load 1 Temperature Coefficient 2	1545	1548	i	4	1	16K/count ²		
A1-1 Warm Load 1 Temperature Coefficient 3	1549	1552	i	4	1	20K/count ³		
A1-1 Warm Load 2 Temperature Coefficient 0	1553	1556	i	4	1	4K		
A1-1 Warm Load 2 Temperature Coefficient 1	1557	1560	i	4	1	9K/count		
A1-1 Warm Load 2 Temperature Coefficient 2	1561	1564	i	4	1	16K/count ²		
A1-1 Warm Load 2 Temperature Coefficient 3	1565	1568	i	4	1	20K/count ³		
A1-1 Warm Load 3 Temperature Coefficient 0	1569	1572	i	4	1	4K		
A1-1 Warm Load 3 Temperature Coefficient 1	1573	1576	i	4	1	9K/count		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
A1-1 Warm Load 3 Temperature Coefficient 2	1577	1580	i	4	1	16	K/count ²	
A1-1 Warm Load 3 Temperature Coefficient 3	1581	1584	i	4	1	20	K/count ³	
A1-1 Warm Load 4 Temperature Coefficient 0	1585	1588	i	4	1	4	K	
A1-1 Warm Load 4 Temperature Coefficient 1	1589	1592	i	4	1	9	K/count	
A1-1 Warm Load 4 Temperature Coefficient 2	1593	1596	i	4	1	16	K/count ²	
A1-1 Warm Load 4 Temperature Coefficient 3	1597	1600	i	4	1	20	K/count ³	
A1-1 Warm Load Center Temperature Coefficient 0	1601	1604	i	4	1	4	K	
A1-1 Warm Load Center Temperature Coefficient 1	1605	1608	i	4	1	9	K/count	
A1-1 Warm Load Center Temperature Coefficient 2	1609	1612	i	4	1	16	K/count ²	
A1-1 Warm Load Center Temperature Coefficient 3	1613	1616	i	4	1	20	K/count ³	
A1-2 Warm Load 1 Temperature Coefficient 0	1617	1620	i	4	1	4	K	
A1-2 Warm Load 1 Temperature Coefficient 1	1621	1624	i	4	1	9	K/count	
A1-2 Warm Load 1 Temperature Coefficient 2	1625	1628	i	4	1	16	K/count ²	
A1-2 Warm Load 1 Temperature Coefficient 3	1629	1632	i	4	1	20	K/count ³	
A1-2 Warm Load 2 Temperature Coefficient 0	1633	1636	i	4	1	4	K	
A1-2 Warm Load 2 Temperature Coefficient 1	1637	1640	i	4	1	9	K/count	
A1-2 Warm Load 2 Temperature Coefficient 2	1641	1644	i	4	1	16	K/count ²	
A1-2 Warm Load 2 Temperature Coefficient 3	1645	1648	i	4	1	20	K/count ³	
A1-2 Warm Load 3 Temperature Coefficient 0	1649	1652	i	4	1	4	K	
A1-2 Warm Load 3 Temperature Coefficient 1	1653	1656	i	4	1	9	K/count	
A1-2 Warm Load 3 Temperature Coefficient 2	1657	1660	i	4	1	16	K/count ²	
A1-2 Warm Load 3 Temperature Coefficient 3	1661	1664	i	4	1	20	K/count ³	
A1-2 Warm Load 4 Temperature Coefficient 0	1665	1668	i	4	1	4	K	
A1-2 Warm Load 4 Temperature Coefficient 1	1669	1672	i	4	1	9	K/count	
A1-2 Warm Load 4 Temperature Coefficient 2	1673	1676	i	4	1	16	K/count ²	
A1-2 Warm Load 4 Temperature Coefficient 3	1677	1680	i	4	1	20	K/count ³	
A1-2 Warm Load Center Temperature Coefficient 0	1681	1684	i	4	1	4	K	
A1-2 Warm Load Center Temperature Coefficient 1	1685	1688	i	4	1	9	K/count	
A1-2 Warm Load Center Temperature Coefficient 2	1689	1692	i	4	1	16	K/count ²	
A1-2 Warm Load Center Temperature Coefficient 3	1693	1696	i	4	1	20	K/count ³	
<Zero Fill>	1697	1700	i	4	1	0		

AMSU-A1 ANALOG TELEMETRY CONVERSION

Volts-to-engineering units (e.g., temperature in Celsius)
 conversion coefficients for the AMSU-A1 analog telemetry items. (NOTE: 1 count = 0.02 volts.)

A1-1 Scan Motor Temp Intercept	1701	1704	i	4	1	3	K	
A1-1 Scan Motor Temp Slope	1705	1708	i	4	1	3	K/volt	
A1-2 Scan Motor Temp Intercept	1709	1712	i	4	1	3	K	
A1-2 Scan Motor Temp Slope	1713	1716	i	4	1	3	K/volt	
A1-1 RF Shelf Temp Intercept	1717	1720	i	4	1	3	K	
A1-1 RF Shelf Temp Slope	1721	1724	i	4	1	3	K/volt	
A1-2 RF Shelf Temp Intercept	1725	1728	i	4	1	3	K	
A1-2 RF Shelf Temp Slope	1729	1732	i	4	1	3	K/volt	
A1-1 Warm Load Temp Intercept	1733	1736	i	4	1	3	K	
A1-1 Warm Load Temp Slope	1737	1740	i	4	1	3	K/volt	
A1-2 Warm Load Temp Intercept	1741	1744	i	4	1	3	K	
A1-2 Warm Load Temp Slope	1745	1748	i	4	1	3	K/volt	
A1-1 Antenna Motor Current Intercept	1749	1752	i	4	1	3	milliamps	
A1-1 Antenna Motor Current Slope	1753	1756	i	4	1	3	milliamps/volt	
A1-2 Antenna Motor Current Intercept	1757	1760	i	4	1	3	milliamps	
A1-2 Antenna Motor Current Slope	1761	1764	i	4	1	3	milliamps/volt	
+15v Signal Processing Intercept	1765	1768	i	4	1	3	volts	
+15v Signal Processing Slope	1769	1772	i	4	1	3		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
-15v Antenna Drive Intercept	1773	1776	i	4	1	3	volts	
-15v Antenna Drive Slope	1777	1780	i	4	1	3		
-15v Signal Processing Intercept	1781	1784	i	4	1	3	volts	
-15v Signal Processing Slope	1785	1788	i	4	1	3		
-15v Antenna Drive Intercept	1789	1792	i	4	1	3	volts	
-15v Antenna Drive Slope	1793	1796	i	4	1	3		
+8v Receiver Amps Intercept	1797	1800	i	4	1	3	volts	
+8v Receiver Amps Slope	1801	1804	i	4	1	3		
+5v Signal Processing Intercept	1805	1808	i	4	1	3	volts	
+5v Signal Processing Slope	1809	1812	i	4	1	3		
+5v Antenna Drive Intercept	1813	1816	i	4	1	3	volts	
+5v Antenna Drive Slope	1817	1820	i	4	1	3		
+8.5v Phase Lock Loop Ch 9/14 Intercept	1821	1824	i	4	1	3	volts	
+8.5v Phase Lock Loop Ch 9/14 Slope	1825	1828	i	4	1	3		
+15v Phase Lock Loop Ch 9/14 Intercept	1829	1832	i	4	1	3	volts	
+15v Phase Lock Loop Ch 9/14 Slope	1833	1836	i	4	1	3		
-15v Phase Lock Loop Ch 9/14 Intercept	1837	1840	i	4	1	3	volts	
-15v Phase Lock Loop Ch 9/14 Slope	1841	1844	i	4	1	3		
GDO Voltage 50.3 GHz Ch 3 Intercept	1845	1848	i	4	1	3	volts	
GDO Voltage 50.3 GHz Ch 3 Slope	1849	1852	i	4	1	3		
GDO Voltage 52.8 GHz Ch 4 Intercept	1853	1856	i	4	1	3	volts	
GDO Voltage 52.8 GHz Ch 4 Slope	1857	1860	i	4	1	3		
GDO Voltage 53.596 GHz Ch 5 Intercept	1861	1864	i	4	1	3	volts	
GDO Voltage 53.596 GHz Ch 5 Slope	1865	1868	i	4	1	3		
GDO Voltage 54.4 GHz Ch 6 Intercept	1869	1872	i	4	1	3	volts	
GDO Voltage 54.4 GHz Ch 6 Slope	1873	1876	i	4	1	3		
GDO Voltage 54.94 GHz Ch 7 Intercept	1877	1880	i	4	1	3	volts	
GDO Voltage 54.94 GHz Ch 7 Slope	1881	1884	i	4	1	3		
GDO Voltage 55.5 GHz Ch 8 Intercept	1885	1888	i	4	1	3	volts	
GDO Voltage 55.5 GHz Ch 8 Slope	1889	1892	i	4	1	3		
PLLO Primary Lock Detect Intercept	1893	1896	i	4	1	3	volts	
PLLO Primary Lock Detect Slope	1897	1900	i	4	1	3		
PLLO Redundant Lock Detect Intercept	1901	1904	i	4	1	3	volts	
PLLO Redundant Lock Detect Slope	1905	1908	i	4	1	3		
GDO Voltage 89.0 GHz Ch 15 Intercept	1909	1912	i	4	1	3	volts	
GDO Voltage 89.0 GHz Ch 15 Slope	1913	1916	i	4	1	3		
<Zero Fill>	1917	1920	i	4	1	0		
AMSU-A2 DIGITAL A CONVERSION								
<i>Counts-to-temperature conversion coefficients for the AMSU-A2 digital A telemetry items.</i>								
Scan Motor Temp. Conv. Coeff 0	1921	1924	i	4	1	4	K	
Scan Motor Temp. Conv. Coeff 1	1925	1928	i	4	1	9	K/count	
Scan Motor Temp. Conv. Coeff 2	1929	1932	i	4	1	16	K/count ²	
Scan Motor Temp. Conv. Coeff 3	1933	1936	i	4	1	20	K/count ³	
Feed Horn Temp. Conv. Coeff 0	1937	1940	i	4	1	4	K	
Feed Horn Temp. Conv. Coeff 1	1941	1944	i	4	1	9	K/count	
Feed Horn Temp. Conv. Coeff 2	1945	1948	i	4	1	16	K/count ²	
Feed Horn Temp. Conv. Coeff 3	1949	1952	i	4	1	20	K/count ³	
RF Mux Temp. Conv. Coeff 0	1953	1956	i	4	1	4	K	
RF Mux Temp. Conv. Coeff 1	1957	1960	i	4	1	9	K/count	
Mux Temp. Conv. Coeff 2	1961	1964	i	4	1	16	K/count ²	
RF Mux Temp. Conv. Coeff 3	1965	1968	i	4	1	20	K/count ³	
Mixer/IF Amplifier Channel 1 Temp. Conv. Coeff 0	1969	1972	i	4	1	4	K	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Mixer/IF Amplifier Channel 1 Temp. Conv. Coeff 1	1973	1976	i	4	1	9K/count		
Mixer/IF Amplifier Channel 1 Temp. Conv. Coeff 2	1977	1980	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 1 Temp. Conv. Coeff 3	1981	1984	i	4	1	20K/count ³		
Mixer/IF Amplifier Channel 2 Temp. Conv. Coeff 0	1985	1988	i	4	1	4K		
Mixer/IF Amplifier Channel 2 Temp. Conv. Coeff 1	1989	1992	i	4	1	9K/count		
Mixer/IF Amplifier Channel 2 Temp. Conv. Coeff 2	1993	1996	i	4	1	16K/count ²		
Mixer/IF Amplifier Channel 2 Temp. Conv. Coeff 3	1997	2000	i	4	1	20K/count ³		
Local Oscillator Channel 1 Temp. Conv. Coeff 0	2001	2004	i	4	1	4K		
Local Oscillator Channel 1 Temp. Conv. Coeff 1	2005	2008	i	4	1	9K/count		
Local Oscillator Channel 1 Temp. Conv. Coeff 2	2009	2012	i	4	1	16K/count ²		
Local Oscillator Channel 1 Temp. Conv. Coeff 3	2013	2016	i	4	1	20K/count ³		
Local Oscillator Channel 2 Temp. Conv. Coeff 0	2017	2020	i	4	1	4K		
Local Oscillator Channel 2 Temp. Conv. Coeff 1	2021	2024	i	4	1	9K/count		
Local Oscillator Channel 2 Temp. Conv. Coeff 2	2025	2028	i	4	1	16K/count ²		
Local Oscillator Channel 2 Temp. Conv. Coeff 3	2029	2032	i	4	1	20K/count ³		
Compensation Motor Temp. Conv. Coeff 0	2033	2036	i	4	1	4K		
Compensation Motor Temp. Conv. Coeff 1	2037	2040	i	4	1	9K/count		
Compensation Motor Temp. Conv. Coeff 2	2041	2044	i	4	1	16K/count ²		
Compensation Motor Temp. Conv. Coeff 3	2045	2048	i	4	1	20K/count ³		
Subreflector Temp. Conv. Coeff 0	2049	2052	i	4	1	4K		
Subreflector Temp. Conv. Coeff 1	2053	2056	i	4	1	9K/count		
Subreflector Temp. Conv. Coeff 2	2057	2060	i	4	1	16K/count ²		
Subreflector Temp. Conv. Coeff 3	2061	2064	i	4	1	20K/count ³		
DC/DC Converter Temp. Conv. Coeff 0	2065	2068	i	4	1	4K		
DC/DC Converter Temp. Conv. Coeff 1	2069	2072	i	4	1	9K/count		
DC/DC Converter Temp. Conv. Coeff 2	2073	2076	i	4	1	16K/count ²		
DC/DC Converter Temp. Conv. Coeff 3	2077	2080	i	4	1	20K/count ³		
RF Shelf Temp. Conv. Coeff 0	2081	2084	i	4	1	4K		
RF Shelf Temp. Conv. Coeff 1	2085	2088	i	4	1	9K/count		
RF Shelf Temp. Conv. Coeff 2	2089	2092	i	4	1	16K/count ²		
RF Shelf Temp. Conv. Coeff 3	2093	2096	i	4	1	20K/count ³		
Detector/preamp Assembly Temp. Conv. Coeff 0	2097	2100	i	4	1	4K		
Detector/preamp Assembly Temp. Conv. Coeff 1	2101	2104	i	4	1	9K/count		
Detector/preamp Assembly Temp. Conv. Coeff 2	2105	2108	i	4	1	16K/count ²		
Detector/preamp Assembly Temp. Conv. Coeff 3	2109	2112	i	4	1	20K/count ³		
Warm Load Center Temp. Conv. Coeff 0	2113	2116	i	4	1	4K		
Warm Load Center Temp. Conv. Coeff 1	2117	2120	i	4	1	9K/count		
Warm Load Center Temp. Conv. Coeff 2	2121	2124	i	4	1	16K/count ²		
Warm Load Center Temp. Conv. Coeff 3	2125	2128	i	4	1	20K/count ³		
Warm Load 1 Temp. Conv. Coeff 0	2129	2132	i	4	1	4K		
Warm Load 1 Temp. Conv. Coeff 1	2133	2136	i	4	1	9K/count		
Warm Load 1 Temp. Conv. Coeff 2	2137	2140	i	4	1	16K/count ²		
Warm Load 1 Temp. Conv. Coeff 3	2141	2144	i	4	1	20K/count ³		
Warm Load 2 Temp. Conv. Coeff 0	2145	2148	i	4	1	4K		
Warm Load 2 Temp. Conv. Coeff 1	2149	2152	i	4	1	9K/count		
Warm Load 2 Temp. Conv. Coeff 2	2153	2156	i	4	1	16K/count ²		
Warm Load 2 Temp. Conv. Coeff 3	2157	2160	i	4	1	20K/count ³		
Warm Load 3 Temp. Conv. Coeff 0	2161	2164	i	4	1	4K		
Warm Load 3 Temp. Conv. Coeff 1	2165	2168	i	4	1	9K/count		
Warm Load 3 Temp. Conv. Coeff 2	2169	2172	i	4	1	16K/count ²		
Warm Load 3 Temp. Conv. Coeff 3	2173	2176	i	4	1	20K/count ³		
Warm Load 4 Temp. Conv. Coeff 0	2177	2180	i	4	1	4K		
Warm Load 4 Temp. Conv. Coeff 1	2181	2184	i	4	1	9K/count		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Warm Load 4 Temp. Conv. Coeff 2	2185	2188	i	4	1	16	K/count ²	
Warm Load 4 Temp. Conv. Coeff 3	2189	2192	i	4	1	20	K/count ³	
Warm Load 5 Temp. Conv. Coeff 0	2193	2196	i	4	1	4	K	
Warm Load 5 Temp. Conv. Coeff 1	2197	2200	i	4	1	9	K/count	
Warm Load 5 Temp. Conv. Coeff 2	2201	2204	i	4	1	16	K/count ²	
Warm Load 5 Temp. Conv. Coeff 3	2205	2208	i	4	1	20	K/count ³	
Warm Load 6 Temp. Conv. Coeff 0	2209	2212	i	4	1	4	K	
Warm Load 6 Temp. Conv. Coeff 1	2213	2216	i	4	1	9	K/count	
Warm Load 6 Temp. Conv. Coeff 2	2217	2220	i	4	1	16	K/count ²	
Warm Load 6 Temp. Conv. Coeff 3	2221	2224	i	4	1	20	K/count ³	
<Zero Fill>	2225	2228	i	4	1	0		
AMSU-A2 ANALOG TELEMETRY CONVERSION								
<i>Volts-to-engineering units (e.g., temperature in Celsius) conversion coefficients for the AMSU-A2 analog telemetry items. (NOTE: 1 count = 0.02 volts.)</i>								
A2 Scan Motor Temp Intercept	2229	2232	i	4	1	3	K	
A2 Scan Motor Temp Slope	2233	2236	i	4	1	3	K/volt	
Compensator Motor Temp Intercept	2237	2240	i	4	1	3	K	
Compensator Motor Temp Slope	2241	2244	i	4	1	3	K/volt	
RF Shelf Temp Intercept	2245	2248	i	4	1	3	K	
RF Shelf Temp Slope	2249	2252	i	4	1	3	K/volt	
Warm Load Temp Intercept	2253	2256	i	4	1	3	K	
Warm Load Temp Slope	2257	2260	i	4	1	3	K/volt	
Compensator Motor Current Intercept	2261	2264	i	4	1	3	milliamps	
Compensator Motor Current Slope	2265	2268	i	4	1	3	milliamps/volt	
Antenna Motor Current Intercept	2269	2272	i	4	1	3	milliamps	
Antenna Motor Current Slope	2273	2276	i	4	1	3	milliamps/volt	
+15v Signal Processing Intercept	2277	2280	i	4	1	3	volt	
+15v Signal Processing Slope	2281	2284	i	4	1	3		
+15v Antenna Drive Intercept	2285	2288	i	4	1	3	volt	
+15v Antenna Drive Slope	2289	2292	i	4	1	3		
-15v Signal Processing Intercept	2293	2296	i	4	1	3	volt	
-15v Signal Processing Slope	2297	2300	i	4	1	3		
-15v Antenna Drive Intercept	2301	2304	i	4	1	3	volt	
-15v Antenna Drive Slope	2305	2308	i	4	1	3		
+8v Receiver Amps Intercept	2309	2312	i	4	1	3	volt	
+8v Receiver Amps Slope	2313	2316	i	4	1	3		
+5v Signal Processing Intercept	2317	2320	i	4	1	3	volt	
+5v Signal Processing Slope	2321	2324	i	4	1	3		
+5v Antenna Drive Intercept	2325	2328	i	4	1	3	volt	
+5v Antenna Drive Slope	2329	2332	i	4	1	3		
GDO Voltage 23.8 GHz Ch 1 Intercept	2333	2336	i	4	1	3	volt	
GDO Voltage 23.8 GHz Ch 1 Slope	2337	2340	i	4	1	3		
GDO Voltage 31.4 GHz Ch 2 Intercept	2341	2344	i	4	1	3	volt	
GDO Voltage 31.4 GHz Ch 2 Slope	2345	2348	i	4	1	3		
<Zero Fill>	2349	2356	i	4	2	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
LUNAR CONTAMINATION CORRECTION Count of Scans Containing Lunar-Contaminated Space Views <i>(Also, see bits 6 and 7 of "Calibration Quality Flags" field in data record.)</i>	2357	2358	i	2	1	0		
-1=the detection algorithm for lunar contamination is turned off 0=the detection algorithm is turned on: no scans containing lunar-contaminated space views were found >0=the detection algorithm is turned on: the value in this field represents the number of scans found that contain lunar-contaminated space views								
Distance Between the Earth and Moon (<i>average of distance computed on first and last scans of orbit</i>)	2359	2360	u	2	1	1	Earth radii (R_E)	
Angle Between the Moon and Sun (<i>as seen from the earth; average of angle computed on first and last scans of orbit; range: 0 - 180</i>)	2361	2362	u	2	1	2	degrees	
FILLER								
<Zero Fill>	2363	2560	i	2	99	0		

4.2 AMSU-A 1b Data Record Format

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
SCAN LINE INFORMATION								
Scan Line Number (<i>cumulative, starting with 1</i>)	1	2	u	2	1	0		
Scan Line Year (<i>four digits, e.g., 2000</i>)	3	4	u	2	1	0		
Scan Line Day of Year (<i>e.g., 365</i>)	5	6	u	2	1	0		
Satellite Clock Drift Delta	7	8	i	2	1	0	milliseconds	
Scan Line UTC Time of Day	9	12	u	4	1	0	milliseconds	
Scan Line Bit Field bit 15: satellite direction (0=northbound; 1=southbound) bit 14: clock drift correction (0=not corrected; 1=scan time corrected for clock drift) bits 13-0: <zero fill>	13	14	u	2	1	0		
Major Frame Count (<i>cumulative, starting with 1</i>) (<i>NOAA</i>) or <Zero Fill> (<i>Metop</i>)	15	16	u	2	1	0		
<Zero Fill>	17	24	i	4	2	0		
QUALITY INDICATORS								
Quality Indicator Bit Field (<i>If a bit is on (=1), the statement is true</i>) bit 31: do not use scan for product generation bit 30: time sequence error detected within this scan (see below) bit 29: data gap precedes this scan bit 28: insufficient data for calibration (see below) bit 27: earth location data not available (see below) bit 26: first good time following a clock update (nominally 0) bit 25: instrument status changed with this scan bits 24-4: <zero fill> bit 3: AMSU sync error detected (NOAA) or <zero fill> (Metop) bit 2: AMSU minor frame error detected (NOAA) or <zero fill> (Metop) bit 1: AMSU major frame error detected (NOAA) or <zero fill> (Metop) bit 0: AMSU parity error detected (NOAA) or <zero fill> (Metop)	25	28	u	4	1	0		
Scan Line Quality Flags [Additional Calibration Problem Code] (<i>If a bit is on (=1), the statement is true. See "Scan Line Quality Flags [Calibration Problem Code]", below.</i>) bit 7: scan line was not calibrated because of satellite maneuver (Metop) or <zero fill> (NOAA) bits 6-0: <zero fill>	29	29	u	1	1	0		
Scan Line Quality Flags [Time Problem Code] (<i>If a bit is on (=1), the statement is true. All bits off implies the scan time is as expected.</i>) bit 7: time field is bad but can probably be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 5: this record starts a sequence that is inconsistent with previous times (i.e., there is a time discontinuity). This may be associated with a spacecraft clock update. (See bit 26, Quality Indicator Bit Field.) bit 4: start of a sequence that apparently repeats scan times that have been previously accepted bits 3-0: <zero fill>	30	30	u	1	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Scan Line Quality Flags [Calibration Problem Code] (<i>If a bit is on (=1), the statement is true. These bits, along with those in "Scan Line Quality Flags [Additional Calibration Problem Code]", complement the channel indicators; all bits set to 0 indicates normal calibration.</i>) bit 7: scan line was not calibrated because of bad time bit 6: scan line was calibrated using fewer than the preferred number of scan lines because of proximity to start or end of data set or to a data gap bit 5: scan line was not calibrated because of bad or insufficient PRT data bit 4: scan line was calibrated but with marginal PRT data bit 3: some uncalibrated channels on this scan (see channel indicators) bit 2: uncalibrated due to instrument mode bit 1: questionable calibration because of antenna position error of space view bit 0: questionable calibration because of antenna position error of blackbody view	31	31	u	1	1	0		
Scan Line Quality Flags [Earth Location Problem Code] (<i>If a bit is on (=1), the statement is true. All bits set to 0 implies the earth location was normal.</i>) bit 7: not earth located because of bad time; earth location fields zero-filled bit 6: earth location questionable: questionable time code (see time problem flags above) bit 5: earth location questionable: marginal agreement with reasonableness check bit 4: earth location questionable: fails reasonableness check bit 3: earth location questionable because of antenna position check bit 2: <zero fill> bit 1: not earth located because of satellite in-plane maneuver (Metop) or <zero fill> (NOAA) bit 0: not earth located because of satellite out-of-plane maneuver (Metop) or <zero fill> (NOAA)	32	32	u	1	1	0		
Calibration Quality Flags (<i>all bits off implies a good calibration</i>) <i>Word 1: Channel 1</i> bits 15-9: <zero fill> bit 8: this scan line is either the last one before or the first one after a sudden, anomalous jump (or drop) in calibration counts bit 7: lunar contamination was detected in the space view of this channel bit 6: the space views of this channel were corrected for lunar contamination when used in the calibration (only applicable if the previous flag [bit 7] is 1; otherwise, zero) bit 5: all bad blackbody counts for scan line bit 4: all bad space view counts for scan line bit 3: all bad PRTs for this line bit 2: marginal blackbody view counts for this line bit 1: marginal space view counts for this line bit 0: marginal PRT temps on this line <i>Words 2-15: Channels 2-15 (in order)</i> <i>Word 16: <zero fill></i>	33	64	u	2	16	0		
<Zero Fill>	65	80	i	4	4	0		
CALIBRATION COEFFICIENTS <i>Note: The following coefficients are only available in Full Scan mode, otherwise the coefficient fields are <Zero Fill>. Refer to Digital A Telemetry, Digital Housekeeping Word 1 for the current mode.</i>								
Primary Calibration Ch 1 Second Order Term, a2	81	84	i	4	1	19		
Primary Calibration Ch 1 First Order Term, a1	85	88	i	4	1	13		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Primary Calibration Ch 1 Zeroth Order Term, a0	89	92	i	4	1	9		
Primary Calibration Ch 2 Second Order Term, a2	93	96	i	4	1	19		
Primary Calibration Ch 2 First Order Term, a1	97	100	i	4	1	13		
Primary Calibration Ch 2 Zeroth Order Term, a0	101	104	i	4	1	9		
Primary Calibration Ch 3 Second Order Term, a2	105	108	i	4	1	19		
Primary Calibration Ch 3 First Order Term, a1	109	112	i	4	1	13		
Primary Calibration Ch 3 Zeroth Order Term, a0	113	116	i	4	1	9		
Primary Calibration Ch 4 Second Order Term, a2	117	120	i	4	1	19		
Primary Calibration Ch 4 First Order Term, a1	121	124	i	4	1	13		
Primary Calibration Ch 4 Zeroth Order Term, a0	125	128	i	4	1	9		
Primary Calibration Ch 5 Second Order Term, a2	129	132	i	4	1	19		
Primary Calibration Ch 5 First Order Term, a1	133	136	i	4	1	13		
Primary Calibration Ch 5 Zeroth Order Term, a0	137	140	i	4	1	9		
Primary Calibration Ch 6 Second Order Term, a2	141	144	i	4	1	19		
Primary Calibration Ch 6 First Order Term, a1	145	148	i	4	1	13		
Primary Calibration Ch 6 Zeroth Order Term, a0	149	152	i	4	1	9		
Primary Calibration Ch 7 Second Order Term, a2	153	156	i	4	1	19		
Primary Calibration Ch 7 First Order Term, a1	157	160	i	4	1	13		
Primary Calibration Ch 7 Zeroth Order Term, a0	161	164	i	4	1	9		
Primary Calibration Ch 8 Second Order Term, a2	165	168	i	4	1	19		
Primary Calibration Ch 8 First Order Term, a1	169	172	i	4	1	13		
Primary Calibration Ch 8 Zeroth Order Term, a0	173	176	i	4	1	9		
Primary Calibration Ch 9 Second Order Term, a2	177	180	i	4	1	19		
Primary Calibration Ch 9 First Order Term, a1	181	184	i	4	1	13		
Primary Calibration Ch 9 Zeroth Order Term, a0	185	188	i	4	1	9		
Primary Calibration Ch 10 Second Order Term, a2	189	192	i	4	1	19		
Primary Calibration Ch 10 First Order Term, a1	193	196	i	4	1	13		
Primary Calibration Ch 10 Zeroth Order Term, a0	197	200	i	4	1	9		
Primary Calibration Ch 11 Second Order Term, a2	201	204	i	4	1	19		
Primary Calibration Ch 11 First Order Term, a1	205	208	i	4	1	13		
Primary Calibration Ch 11 Zeroth Order Term, a0	209	212	i	4	1	9		
Primary Calibration Ch 12 Second Order Term, a2	213	216	i	4	1	19		
Primary Calibration Ch 12 First Order Term, a1	217	220	i	4	1	13		
Primary Calibration Ch 12 Zeroth Order Term, a0	221	224	i	4	1	9		
Primary Calibration Ch 13 Second Order Term, a2	225	228	i	4	1	19		
Primary Calibration Ch 13 First Order Term, a1	229	232	i	4	1	13		
Primary Calibration Ch 13 Zeroth Order Term, a0	233	236	i	4	1	9		
Primary Calibration Ch 14 Second Order Term, a2	237	240	i	4	1	19		
Primary Calibration Ch 14 First Order Term, a1	241	244	i	4	1	13		
Primary Calibration Ch 14 Zeroth Order Term, a0	245	248	i	4	1	9		
Primary Calibration Ch 15 Second Order Term, a2	249	252	i	4	1	19		
Primary Calibration Ch 15 First Order Term, a1	253	256	i	4	1	13		
Primary Calibration Ch 15 Zeroth Order Term, a0	257	260	i	4	1	9		
Secondary Calibration Ch 1 Second Order Term, a2	261	264	i	4	1	19		
Secondary Calibration Ch 1 First Order Term, a1	265	268	i	4	1	13		
Secondary Calibration Ch 1 Zeroth Order Term, a0	269	272	i	4	1	9		
Secondary Calibration Ch 2 Second Order Term, a2	273	276	i	4	1	19		
Secondary Calibration Ch 2 First Order Term, a1	277	280	i	4	1	13		
Secondary Calibration Ch 2 Zeroth Order Term, a0	281	284	i	4	1	9		
Secondary Calibration Ch 3 Second Order Term, a2	285	288	i	4	1	19		
Secondary Calibration Ch 3 First Order Term, a1	289	292	i	4	1	13		
Secondary Calibration Ch 3 Zeroth Order Term, a0	293	296	i	4	1	9		
Secondary Calibration Ch 4 Second Order Term, a2	297	300	i	4	1	19		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Secondary Calibration Ch 4 First Order Term, a1	301	304	i	4	1	13		
Secondary Calibration Ch 4 Zeroth Order Term, a0	305	308	i	4	1	9		
Secondary Calibration Ch 5 Second Order Term, a2	309	312	i	4	1	19		
Secondary Calibration Ch 5 First Order Term, a1	313	316	i	4	1	13		
Secondary Calibration Ch 5 Zeroth Order Term, a0	317	320	i	4	1	9		
Secondary Calibration Ch 6 Second Order Term, a2	321	324	i	4	1	19		
Secondary Calibration Ch 6 First Order Term, a1	325	328	i	4	1	13		
Secondary Calibration Ch 6 Zeroth Order Term, a0	329	332	i	4	1	9		
Secondary Calibration Ch 7 Second Order Term, a2	333	336	i	4	1	19		
Secondary Calibration Ch 7 First Order Term, a1	337	340	i	4	1	13		
Secondary Calibration Ch 7 Zeroth Order Term, a0	341	344	i	4	1	9		
Secondary Calibration Ch 8 Second Order Term, a2	345	348	i	4	1	19		
Secondary Calibration Ch 8 First Order Term, a1	349	352	i	4	1	13		
Secondary Calibration Ch 8 Zeroth Order Term, a0	353	356	i	4	1	9		
Secondary Calibration Ch 9 Second Order Term, a2	357	360	i	4	1	19		
Secondary Calibration Ch 9 First Order Term, a1	361	364	i	4	1	13		
Secondary Calibration Ch 9 Zeroth Order Term, a0	365	368	i	4	1	9		
Secondary Calibration Ch 10 Second Order Term, a2	369	372	i	4	1	19		
Secondary Calibration Ch 10 First Order Term, a1	373	376	i	4	1	13		
Secondary Calibration Ch 10 Zeroth Order Term, a0	377	380	i	4	1	9		
Secondary Calibration Ch 11 Second Order Term, a2	381	384	i	4	1	19		
Secondary Calibration Ch 11 First Order Term, a1	385	388	i	4	1	13		
Secondary Calibration Ch 11 Zeroth Order Term, a0	389	392	i	4	1	9		
Secondary Calibration Ch 12 Second Order Term, a2	393	396	i	4	1	19		
Secondary Calibration Ch 12 First Order Term, a1	397	400	i	4	1	13		
Secondary Calibration Ch 12 Zeroth Order Term, a0	401	404	i	4	1	9		
Secondary Calibration Ch 13 Second Order Term, a2	405	408	i	4	1	19		
Secondary Calibration Ch 13 First Order Term, a1	409	412	i	4	1	13		
Secondary Calibration Ch 13 Zeroth Order Term, a0	413	416	i	4	1	9		
Secondary Calibration Ch 14 Second Order Term, a2	417	420	i	4	1	19		
Secondary Calibration Ch 14 First Order Term, a1	421	424	i	4	1	13		
Secondary Calibration Ch 14 Zeroth Order Term, a0	425	428	i	4	1	9		
Secondary Calibration Ch 15 Second Order Term, a2	429	432	i	4	1	19		
Secondary Calibration Ch 15 First Order Term, a1	433	436	i	4	1	13		
Secondary Calibration Ch 15 Zeroth Order Term, a0	437	440	i	4	1	9		
<Zero Fill>	441	456	i	4	4	0		
NAVIGATION								
Navigation Status Bit Field (except for bits 16-12, all other meaningful bits are NOAA specific; these bits will be zero filled for Metop)	457	460	u	4	1	0		
bits 31-17: <zero fill>								
bit 16: earth location corrected for Euler angles (0=FALSE; 1=TRUE)								
bits 15-12: earth location indicator (0=earth location available; 1=user ephemeris files greater than 24 hours old; 2=no earth location available)								
bits 11-8: spacecraft attitude control (0=operating in YGC or NOMINAL mode; 1=operating in another mode; 2=attitude exceeds nominal tolerance; 3=both 1 and 2)								
bits 7-4: attitude SMODE (0=nominal mode; 1=rate nulling mode; 2=YGC mode; 3=search mode; 4=coast mode)								
bits 3-0: attitude PWTIP\$AC (0=nominal mode/no test; 1=yaw axis test in progress; 2=roll axis test in progress; 3=pitch axis test in progress)								
Time Associated with Euler Angles (range: 0 - 4,294,967,295 (TBC))	461	464	u	4	1	0seconds		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Attitude Angles Word 1: Roll Word 2: Pitch Word 3: Yaw	465	470	i	2	3	3	degrees	
Spacecraft Altitude above Reference Ellipsoid	471	472	u	2	1	1	kilometers	
Angular Relationships (<i>local azimuth range +/- 180.00 degrees</i>) Word 1: Solar Zenith Angle, FOV 1 Word 2: Satellite Zenith Angle, FOV 1 Word 3: Local Azimuth Angle, FOV 1 Word 4: Solar Zenith Angle, FOV 2 ... (set of 3 angles every FOV) ... Word 90: Local Azimuth Angle, FOV 30	473	652	i	2	90	2	degrees	
Earth Location (<i>north latitude and east longitude are positive</i>) Word 1: Latitude, FOV 1 Word 2: Longitude, FOV 1 Word 3: Latitude, FOV 2 ... (lat/lon word pair every FOV) ... Word 60: Longitude, FOV 30	653	892	i	4	60	4	degrees	
<Zero Fill>	893	896	i	4	1	0		
AMSU-A1 DIGITAL A TELEMETRY								
Synchronization Sequence (hex FF)	897	899	u	1	3	0		
Unit Identification and Serial Number 17=Flight Model (FM) 3 Module A1 01=FM 4 Module A1 02=FM 5 Module A1 03=FM 6 Module A1 33=FM 7 Module A1	900	900	u	1	1	0		
Digital Housekeeping <i>Word 1: Data 1</i> bit 7: <zero fill> bit 6: cold cal position msb bit 5: cold cal position lsb (cold cal position: 0=6.667 deg from -Z; 1=8.333 deg; 2=9.999 deg; 3=13.332 deg) bit 4: nadir mode (0=not in nadir; 1=nadir) bit 3: cold cal mode (0=not in cold cal; 1=cold cal) bit 2: warm cal mode (0=not in warm cal; 1=warm cal) bit 1: full scan mode (0=not full scan; 1=full scan) bit 0: <zero fill> <i>Word 2: Data 2</i> bits 7-5: <zero fill> bit 4: survival heater power (0=off; 1=on) bit 3: PLL power (0=redundant; 1=primary) bit 2: scanner A1-2 power (0=off; 1=on) bit 1: scanner A1-1 power (0=off; 1=on) bit 0: <zero fill> Words 3-4: <Zero Fill>	901	904	u	1	4	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Scene Telemetry (<i>Scanner is parked at warm cal position while in warm cal mode, cold cal position while in cold cal mode, and nadir position while in nadir mode (see Digital Housekeeping Word 1, above). In parked modes, words 1 through 17 are repeated 29 times for a total of 30 data sets at the designated scanner position. In full scan mode, the scanner is stepped from positions 1 to 30 as indicated.)</i>	905	1924	u	2	510	0		
Word 1: Reflector A1-1, position 1, first reading Word 2: Reflector A1-2, position 1, first reading Word 3: Reflector A1-1, position 1, second reading Word 4: Reflector A1-2, position 1, second reading Words 5-17: Scene count at position 1, channels 3 through 15 (in order) Word 18: Reflector A1-1, position 2, first reading ... (17 words every position) ... Words 498-510: Scene count at position 30, channels 3 through 15 (in order)								
Cold Calibration Telemetry (<i>These words are zero-filled in warm cal, cold cal, and nadir modes. In full scan mode, these words contain the following data.</i>) Word 1: Reflector A1-1, cold calibration position, first reading Word 2: Reflector A1-2, cold calibration position, first reading Word 3: Reflector A1-1, cold calibration position, second reading Word 4: Reflector A1-2, cold calibration position, second reading Words 5-17: Cold cal count 1, channels 3 through 15 (in order) Words 18-30: Cold cal count 2, channels 3 through 15 (in order)	1925	1984	u	2	30	0counts		
Temperature Sensor Telemetry Word 1: Scan motor A1-1 Word 2: Scan motor A1-2 Word 3: Feed horn A1-1 Word 4: Feed horn A1-2 Word 5: RF mux A1-1 Word 6: RF mux A1-2 Words 7-12: Local oscillator channels 3 - 8 Word 13: Local oscillator channel 15 Word 14: PLL LO #2 Channels 9 - 14 Word 15: PLL LO #1 Channels 9 - 14 Word 16: <unused> (s/n 105-109); PLLO (reference oscillator) (s/n 101-104) Words 17-22: Mixer/IF amplifier channels 3 - 8 Word 23: Mixer/IF amplifier channel 9/14 Word 24: Mixer/IF amplifier channel 15 Word 25: IF amplifier channel 11/14 Words 26-28: IF amplifier channels 9 - 11 Word 29: DC/DC converter Words 30-31: IF amplifier channels 13 - 14 Word 32: IF amplifier channel 12 Word 33: RF shelf A1-1 Word 34: RF shelf A1-2 Word 35: Detector/preamplifier assembly Words 36-39: A1-1 warm load 1 - 4 Word 40: A1-1 warm load center Words 41-44: A1-2 warm load 1 - 4 Word 45: A1-2 warm load center Word 46: Reference voltage	1985	2076	u	2	46	0counts		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Warm Calibration Telemetry (<i>These words are zero-filled in warm cal, cold cal, and nadir modes. In full scan mode, these words contain the following data.</i>)	2077	2136	u	2	30	0	counts	
Word 1: Reflector A1-1, warm calibration position, first reading Word 2: Reflector A1-2, warm calibration position, first reading Word 3: Reflector A1-1, warm calibration position, second reading Word 4: Reflector A1-2, warm calibration position, second reading Words 5-17: Warm cal count 1, channels 3 through 15 (in order) Words 18-30: Warm cal count 2, channels 3 through 15 (in order)								
<Zero Fill>	2137	2140	i	4	1	0		
AMSU-A1 DIGITAL B TELEMETRY								
Digital B Telemetry Update Flags (<i>If bit = 1, associated telemetry item was not updated during most recent minor frame cycle - possibly due to lost frame.</i>)	2141	2142	u	2	1	0		
bit 15: <zero fill> bit 14: cold cal position, msb bit 13: cold cal position, lsb bit 12: antenna in nadir position bit 11: antenna in cold cal position bit 10: antenna in warm cal position bit 9: full scan mode bits 8-6: <zero fill> bit 5: module power bit 4: survival heater bit 3: phase lock loop bit 2: scanner A1-2 power bit 1: scanner A1-1 power bit 0: <zero fill>								
Digital B Telemetry for AMSU-A1 <i>If bits 9-12 are all set to 0, the instrument is operating in NO mode. Digital A telemetry, analog telemetry, and bits 3, 13, and 14 of the digital B telemetry should be ignored.</i> <i>* For cold cal position bits 13 and 14: 0=6.667; 1=8.333; 2=9.999; 3=13.332 degrees from -Z.</i>	2143	2144	u	2	1	0		2
bit 15: <zero fill> bit 14: cold cal position, msb bit 13: cold cal position, lsb bit 12: antenna in nadir position (0=no; 1=yes) bit 11: antenna in cold cal position (0=no; 1=yes) bit 10: antenna in warm cal position (0=no; 1=yes) bit 9: full scan (0=no; 1=yes) bits 8-6: <zero fill> bit 5: module power (0=disconnect; 1=connect) bit 4: survival heater (0=off; 1=on) bit 3: phase lock loop (0=redundant; 1=primary) bit 2: scanner A1-2 power (0=off; 1=on) bit 1: scanner A1-1 power (0=off; 1=on) bit 0: <zero fill>								
<Zero Fill>	2145	2148	i	4	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
AMSU-A1 ANALOG TELEMETRY								
Analog Telemetry Update Flags (If bit = 1, associated telemetry item was not updated during most recent minor frame cycle - possibly due to lost frame.) bits 31-28: <zero fill> bit 27: GDO voltage 89.0 GHz ch. 15 bit 26: PLL redundant lock detect bit 25: PLL primary lock detect bit 24: GDO voltage 55.5 GHz ch. 8 bit 23: GDO voltage 54.94 GHz ch. 7 bit 22: GDO voltage 54.4 GHz ch. 6 bit 21: GDO voltage 53.596 GHz ch. 5 bit 20: GDO voltage 52.8 GHz ch. 4 bit 19: GDO voltage 50.3 GHz ch. 3 bit 18: -15 VDC phase lock loop ch. 9/14 bit 17: +15 VDC phase lock loop ch. 9/14 bit 16: +10 VDC receiver mixer/IF; +8.5 VDC phase lock loop ch. 9/14 bit 15: +5 VDC (antenna drive) bit 14: +5 VDC (signal processing) bit 13: +8 VDC (receiver amplifiers) bit 12: -15 VDC (antenna drive) bit 11: -15 VDC (signal processing) bit 10: +15 VDC (antenna drive) bit 9: +15 VDC (signal processing) bit 8: antenna A1-2 drive motor current (avg) bit 7: antenna A1-1 drive motor current (avg) bit 6: warm load A1-2 temperature bit 5: warm load A1-1 temperature bit 4: RF shelf A1-2 temperature bit 3: RF shelf A1-1 temperature bit 2: A1-2 scanner motor temperature bit 1: A1-1 scanner motor temperature bit 0: <zero fill>	2149	2152	u	4	1	0		
A1 Analog Telemetry (range: 0 - 255) Word 1: A1-1 scanner motor temperature Word 2: A1-2 scanner motor temperature Word 3: RF shelf A1-1 temperature Word 4: RF shelf A1-2 temperature Word 5: Warm load A1-1 temperature Word 6: Warm load A1-2 temperature Word 7: Antenna A1-1 drive motor current (Avg) Word 8: Antenna A1-2 drive motor current (Avg) Word 9: +15 VDC (signal processing) Word 10: +15 VDC (antenna drive) Word 11: -15 VDC (signal processing) Word 12: -15 VDC (antenna drive) Word 13: +8 VDC (receiver amplifiers) Word 14: +5 VDC (signal processing) Word 15: +5 VDC (antenna drive) Word 16: +10 VDC receiver mixer/IF (s/n 105-109); +8.5 VDC phase lock loop ch. 9/14 (s/n 101-104) Word 17: +15 VDC phase lock loop ch. 9/14 Word 18: -15 VDC phase lock loop ch. 9/14 Word 19: GDO voltage 50.3 Ghz ch. 3 Word 20: GDO voltage 52.8 Ghz ch. 4 Word 21: GDO voltage 53.596 Ghz ch. 5 Word 22: GDO voltage 54.4 Ghz ch. 6 Word 23: GDO voltage 54.94 Ghz ch. 7 Word 24: GDO voltage 55.5 Ghz ch. 8 Word 25: PLL primary lock detect Word 26: PLL redundant lock detect Word 27: GDO voltage 89.0 Ghz ch. 15 Word 28: <zero fill>	2153	2180	u	1	28	0	counts	
<Zero Fill>	2181	2184	i	4	1	0		
AMSU-A2 DIGITAL A TELEMETRY								
Synchronization Sequence (hex FF)	2185	2187	u	1	3	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Unit Identification and Serial Number -Flight Model (FM) 3 Module A2 22=FM 4 Module A2 26=FM 5 Module A2 30=FM 6 Module A2 34=FM 7 Module A2	2188	2188	u	1	1	0		
Digital Housekeeping <i>Word 1: Data 1</i> bit 7: <zero fill> bit 6: cold cal position msb bit 5: cold cal position lsb bit 4: nadir mode (0=not in nadir; 1=nadir) bit 3: cold cal mode (0=not in cold cal; 1=cold cal) bit 2: warm cal mode (0=not in warm cal; 1=warm cal) bit 1: full scan mode (0=not full scan; 1=full scan) bit 0: <zero fill> <i>Word 2: Data 2</i> bits 7-5: <zero fill> bit 4: survival heater power (0=off; 1=on) bit 3: <zero fill> bit 2: scanner compensator power (0=off; 1=on) bit 1: scanner A2 power (0=off; 1=on) bit 0: <zero fill> <i>Word 3: <Zero Fill></i>	2189	2192	u	1	4	0		
Scene Telemetry (<i>Scanner is parked at warm cal position while in warm cal mode, cold cal position while in cold cal mode, and nadir position while in nadir mode (see Digital Housekeeping Word 1, above). In parked modes, words 1 through 4 are repeated 29 times for a total of 30 data sets at the designated scanner position. In full scan mode, the scanner is stepped from positions 1 to 30 as indicated.</i>) Word 1: Reflector, position 1, first reading Word 2: Reflector, position 1, second reading Words 3-4: Scene count at position 1, Channels 1 and 2 (in order) Word 5: Reflector, position 2, first reading ... (4 words every position) ... Words 119-120: Scene count at position 30, Channels 1 and 2 (in order)	2193	2432	u	2	120	0		
Cold Calibration Telemetry (<i>These words are zero-filled in warm cal, cold cal, and nadir modes. In full scan mode, these words contain the following data.</i>) Word 1: Reflector, cold calibration position, first reading Word 2: Reflector, cold calibration position, second reading Words 3-4: Cold cal count 1, channels 1 and 2 Words 5-6: Cold cal count 2, channels 1 and 2	2433	2444	u	2	6	0 counts		
Temperature Sensor Telemetry Word 1: Scan motor Word 2: Feed horn Word 3: RF mux Words 4-5: Mixer/IF amplifier channels 1 and 2 Words 6-7: Local oscillator channels 1 and 2 Word 8: Compensation motor Word 9: Subreflector Word 10: DC/DC converter Word 11: RF shelf A2 Word 12: Detector/preamplifier assembly Word 13: Warm load center Words 14-19: Warm load 1 - 6 Word 20: Reference voltage	2445	2484	u	2	20	0 counts		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Warm Calibration Telemetry (<i>These words are zero-filled in warm cal, cold cal, and nadir modes. In full scan mode, these words contain the following data.</i>) Word 1: Reflector, warm calibration position, first reading Word 2: Reflector, warm calibration position, second reading Words 3-4: Warm calibration 1, channels 1 and 2 Words 5-6: Warm calibration 2, channels 1 and 2	2485	2496	u	2	6	0	counts	
<Zero Fill>	2497	2500	i	4	1	0		
AMSU-A2 DIGITAL B TELEMETRY								
Digital B Telemetry Update Flags (<i>If bit = 1, associated telemetry item was not updated during most recent minor frame cycle - possibly due to lost frame.</i>) bit 15: <zero fill> bit 14: cold cal position, msb bit 13: cold cal position, lsb bit 12: antenna in nadir position bit 11: antenna in cold cal position bit 10: antenna in warm cal position bit 9: full scan mode bits 8-5: <zero fill> bit 4: survival heater bit 3: module power bit 2: compensator motor bit 1: scanner A2 power bit 0: <zero fill>	2501	2502	u	2	1	0		
Digital B Telemetry for AMSU-A2 * If bits 9-12 are all set to 0, the instrument is operating in NO mode. Digital A telemetry, analog telemetry, and bits 13 and 14 of the digital B telemetry should be ignored. * For cold cal position bits 13 and 14: 0=6.667; 1=8.333; 2=9.999; 3=13.332 degrees from -Z. bit 15: <zero fill> bit 14: cold cal position, msb bit 13: cold cal position, lsb bit 12: antenna in nadir position (0=no; 1=yes) bit 11: antenna in cold cal position (0=no; 1=yes) bit 10: antenna in warm cal position (0=no; 1=yes) bit 9: full scan mode (0=no; 1=yes) bits 8-5: <zero fill> bit 4: survival heater (0=off; 1=on) bit 3: module power (0=disconnect; 1=connect) bit 2: compensator motor (0=off; 1=on) bit 1: scanner A2 power (0=off; 1=on) bit 0: <zero fill>	2503	2504	u	2	1	0		2
<Zero Fill>	2505	2508	i	4	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
AMSU-A2 ANALOG TELEMETRY DATA								
analog Telemetry Update Flags (<i>If bit = 1, associated telemetry item was not updated during most recent minor frame cycle - possibly due to lost frame.</i>) bits 31-16: <zero fill> bit 15: LO voltage ch. 2 (31.4 GHz) bit 14: LO voltage ch. 1 (23.8 GHz) bit 13: +5 VDC (antenna drive) bit 12: +5 VDC (signal processing) bit 11: +10 VDC (receiver/mixer/IF) (s/n 105-109); +8 VDC (receiver) (s/n 101-104) bit 10: -15 VDC (antenna drive) bit 9: -15 VDC (signal processing) bit 8: +15 VDC (antenna drive) bit 7: +15 VDC (signal processing) bit 6: antenna drive motor current (avg) bit 5: compensator motor current (avg) bit 4: warm load A2 temperature bit 3: RF shelf temperature bit 2: compensator motor temperature bit 1: scanner motor temperature bit 0: <zero fill>	2509	2512	u	4	1	0		
A2 Analog Telemetry (range: 0 - 255) Word 1: Scanner motor temperature Word 2: Compensator motor temperature Word 3: RF shelf temperature Word 4: Warm load A2 temperature Word 5: Compensator motor current (Avg) Word 6: Antenna drive motor current (Avg) Word 7: +15 VDC (signal processing) Word 8: +15 VDC (antenna drive) Word 9: -15 VDC (signal processing) Word 10: -15 VDC (antenna drive) Word 11: +10 VDC (receiver/mixer/IF) (s/n 105-109); +8 VDC (receiver) (s/n 101-104) Word 12: +5 VDC (signal processing) Word 13: +5 VDC (antenna drive) Word 14: LO voltage ch. 1 (23.8 GHz) Word 15: LO voltage ch. 2 (31.4 GHz) Word 16: <zero fill>	2513	2528	u	1	16	0	counts	
LUNAR CONTAMINATION CORRECTION								
Space View Count Corrections (<i>If the value is added to the space view, or "cold cal", counts (of "Cold Calibration Telemetry" field), the value used in the calibration is obtained. A value of 0 indicates that no correction was made.</i>) Word 1: Count correction for channel 1 Words 2-15: Count corrections for channels 2-15, in order <Zero Fill>	2529	2543	u	1	15	0	counts	
Lunar Azimuth Angles (<i>with respect to the space view position of each AMSU-A device; range: -180 to +180</i>) Word 1: Angle for A1-1 device Word 2: Angle for A1-2 device Word 3: Angle for A2 device	2544	2544	i	1	1	0		
Lunar Elevation Angles (<i>with respect to the space view position of each AMSU-A device; range: -90 to +90</i>) Word 1: Angle for A1-1 device Word 2: Angle for A1-2 device Word 3: Angle for A2 device	2545	2550	i	2	3	2	degrees	
FILLER								
<Zero Fill>	2551	2556	i	2	3	2	degrees	
	2557	2560	i	4	1	0		

5 Notes

- 1) According to AD-1 and AD-3, there is no "PLLO (Reference Oscillator)" for the AMSU-A instruments on-board NOAA-NN' and Metop.
- 2) The meaning of bits 9-12, when they are all zero, has changed. For NOAA-KLM, when these bits were zero, the instrument was in the warm calibration position.

6 Acronyms

AD	Applicable Document
AIP	AMSU Instrument Processor
AMSU-A	Advanced Microwave Sounding Unit-A
ASCII	American Standard Code for Information Interchange
AU	Astronomical Unit
cm	centimeter
CPIDS	Calibration Parameters Input Data Set
CSC	Computer Sciences Corporation
DC	Direct Current
FM	Flight Model
FOV	Field Of View
GAC	Global Area Coverage
GDO	Gunn Diode Oscillator
GHz	Gigahertz
HRPT	High Resolution Picture Transmission
IF	Intermediate Frequency
IJPS	Initial Joint Polar-orbiting Operational Satellite System
K	Kelvin
km	kilometer
LAC	Local Area Coverage
LO	Local Oscillator
lsb	least significant bit
m	(1) meter; (2) milli-
Metop	Meteorological Operational Satellite
msb	most significant bit
MUX	Multiplexer
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
PACS	Polar Acquisition and Control Subsystem
PLLO	Phase Lock Loop Oscillator
PRT	Platinum Resistance Thermometer
R _E	Earth Radii
RF	Radio Frequency
SOCC	Satellite Operations Control Center
sr	steradian
TBD	To Be Determined
TIP	TIROS Information Processor
TIROS	Television Infrared Observation Satellite
UTC	Universal Time Coordinated

DRAFT

DRAFT

V	Volts
VDC	Volts Direct Current
W	Watts
YGC	Yaw Gyrocompassing

DRAFT

DRAFT